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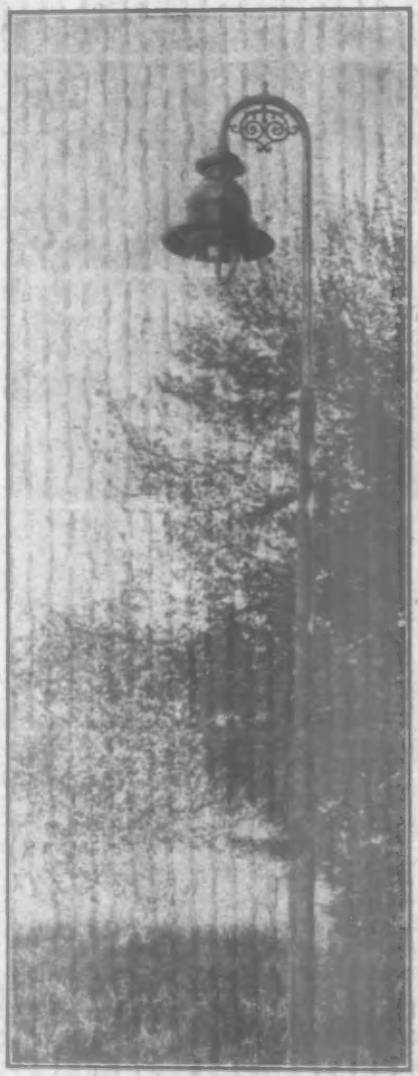

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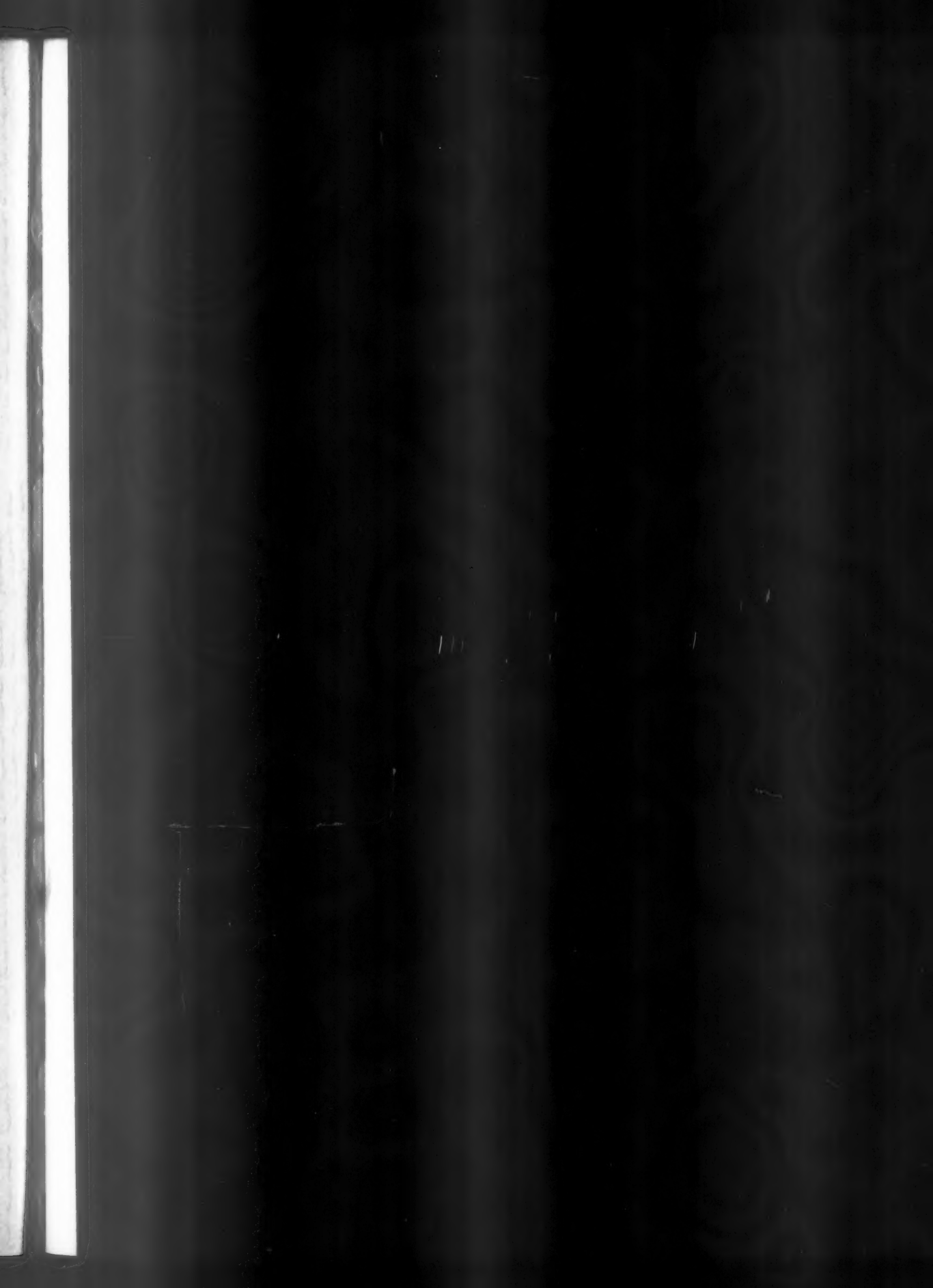
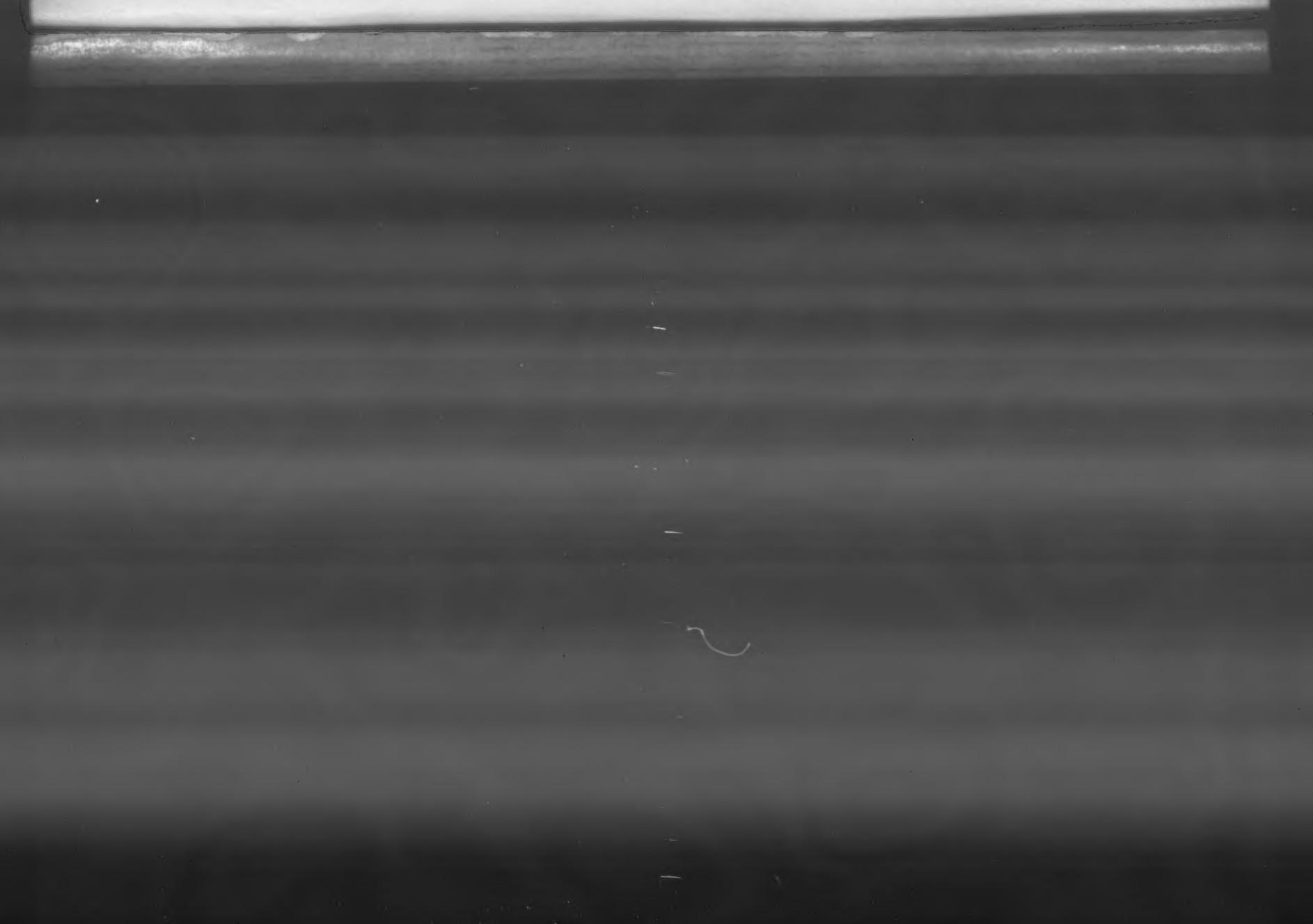




MUNICIPAL ENGINEERING

VOLUME XXVII SEPTEMBER, NINETEEN HUNDRED FOUR NUMBER THREE

OIL ON RAILWAY ROADBEDS.

The problem of reducing the dust on railway roadbeds is one which has not yet reached an economical solution. It comes up for consideration frequently, and is now coming into some prominence with reference to roadbeds of interurban railways. The removal of the smoke and cinder nuisance from these roads makes the dust nuisance the more subject to complaint.

The steam railroads have long recognized broken stone ballast as the most satisfactory from the standpoint of freedom from dust as well as for other reasons, and the roads whose proximity to suitable stone deposits makes the material comparatively cheap, and those whose traffic is such that the expense can be met, from increase due to comfort or otherwise, have done and are doing much to make their roads dustless by the use of material large and heavy enough to keep its place under the rush of the trains and to keep itself clean with the help of rain.

Roads and divisions of roads not able or willing to take this expensive step have tried other methods of reducing the dust nuisance, and Mr. J. H. Nichol, when in charge of a division of the Pennsylvania system, developed an elaborate system of application of oil to the road bed by means of sprinkling apparatus mounted on cars.

There are a number of reports of the success of this method, some of which have been published, and some made for the information of road officials only. A summary of these reports follows:

One of the former district managers of the company operating Mr. Nichol's patents, Mr. W. W. Worthington, states that he found that good results could be obtained by using about 2,000 gallons of oil per mile of single track each year for three or four years, so that the oil would work down three or four inches under the ties. After the surface of the track is once thoroughly saturated the oil should be used every other year.

A non-evaporative residuum oil is used whose quality depends upon the methods used in extracting all the more valuable portions. Mr. Nichols reports that in 1898 he paid 2 cents a gallon or $40 a mile for oil and about $5 a mile for all other expenses except royalty. In other places and other years oil costs 3 to 4 cents a gallon. At the same time he calls attention to the waterproofing of the surface and to the renewing of the oil on the surface by rainwater floating it up from the undried store which has soaked into the ballast.

Some supervisors of the application of oil report only partial satisfaction from a single application of oil. They report that the rain floats the oil off into the ditches, and that, especially in cinder ballast, the finer material was picked up by the rush of air under a train and, being oily, produces more damage upon clothing of passengers than the dust would have made. The tamping and the replacing of ties disturb the oiled surface and it cannot be successfully removed and replaced after such repairs, so that local application of oil is necessary after such disturbance. One engineer reports settlement of water under ties, indicating that a single coat of oil made the roadbed waterproof, at least in part, and suggesting better form of surface for drainage as the proper remedy. He thinks the oil spoils gravel for use as ballast. Another engineer reports fairly good results with a single coat of 2,400 gallons a mile, which cost $96 in place. He thinks two or three coats would add considerably to the comfort of passengers, but that cinder ballast is too light to keep its place and will cause the complaints mentioned above. An assistant engineer on the Pennsylvania Railroad reported to the Railway Maintenance-of-Way Association that the application of oil cost $80

a mile on the Atlantic City and Philadelphia line for each application, two being made the first year. The spotting of clothes by fine material coated with oil gave some trouble.

The roadmaster of the Long Island Railroad reported the application of oil for three years in succession to about seventy miles of road which had not yet been ballasted, at a total cost of $180 per mile for the three oilings, including royalty. The first year 2,000 to 2,200 gallons of oil were applied at a cost of $69, including royalty, the amount being increased to 2,500 gallons when very fine sand was encountered. The second year the amount of oil was 1,800 and the third year 1,500 gallons a mile, but the work cost $50 and $61, respectively, without royalty, because of the difference in price of oil. The best results were obtained in heavy sand or light gravel, the oil saturating several inches in depth, rendering the surface waterproof and thus preventing heaving by frost. In fine sand a thick crust was formed preventing further penetration of oil and stopping the dust. If this crust is broken the untreated sand is exposed and there may be dust, some of it oily. Odor from the fresh oil disappears in a very few days.

Several other roads report similar results, some more favorable than those given above. Statements of cost per year per mile vary from $32 to $100 according to cost of oil and number of applications, and one estimate of subsequent cost of keeping dust down is as low as $4 to $11 a year. Several advantages to the railroad are enumerated in addition to the greater comfort to the passengers.

Interurban cars do not have so strong an effect upon the roadbed as the longer fast passenger trains, and the oiling of their roadbeds would probably have still more satisfactory results. It may also be suggested that the oils with asphaltic base have been found more satisfactory for road use than those with paraffine base. This superiority may extend to railway roadbed use also.

A STEEL CONCRETE BUILDING.

By George B. Low, Halifax, N. S.

The accompanying illustrations show the fronts on two streets of a building in Halifax, N. S., owned by Messrs. A. M. Bell & Co., in which the walls and piers are entirely of concrete construction and steel bars.

The majority of buildings of concrete construction have facings of brick, stone or marble; in this case all the mouldings and face work of the fronts are of concrete. The walls were constructed in the usual way by building up wooden sheeting on each side and filling in the concrete, and are twenty inches thick to the top of the first floor, sixteen inches thick to the top of the second floor and the three top stories twelve inches thick.

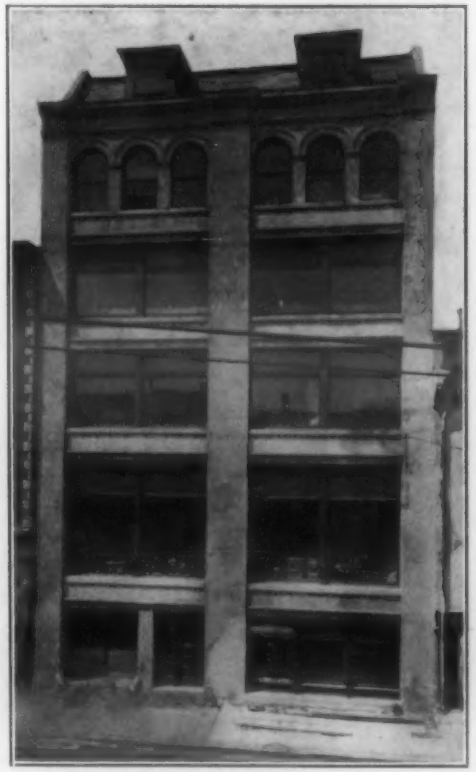
The mouldings of the fronts were formed by building up the reverse mouldings in wood, thus forming the concrete mouldings in one piece with the walls.

In order to prevent cracks, due to expansion and contraction of the concrete, the main piers in both fronts were built up to the top separately, with boxes built in forming recesses to receive the ends of the lintels, which were built in later, thus giving joints where the movements due to expansion and contraction would be taken up. These lintels are reinforced by iron beams and twisted steel rods, as are all the piers and walls, iron rods being laid in the walls horizontally every four feet in hight, the piers having vertical twisted iron rods running the full hight.

During construction the sand and gravel were stored in the basement at one end of the building, the cement at the other. The mixing was done near the center of the building, also in the basement. The concrete was filled into iron wheelbarrows, which were hoisted to the required level by a horse, wheeled to the required position and dumped directly into the wall.

The concrete in the walls is composed of seven parts of sand and gravel to one of cement; that in the piers of five parts of sand and gravel to one of cement, and the mouldings were made of equal parts of sand and cement filled in with a trowel by hand just before the adjoining wall was filled in. By coating the wooden moulds with a preparation of French chalk and paraffin oil, the cement came to a smooth surface which needed very slight touching up with neat cement when the moulds were removed. Within the building is a large two-story vault with double 8-inch cinder concrete walls and

Front view.



Rear view.

CONCRETE STEEL BUILDING AT HALIFAX, N. S.

4-inch air space. The shelves in vault are also cement and expanded metal lath, 1½ inches thick. There is also expanded metal used in the fronts about the windows.

The building measures 120 feet from street to street, is 40 feet wide and 7. feet high from sidewalk on lower street to highest point of walls. The name and number on store are raised cement letters, rough cast between. All other parts of the building are finished smooth. The date, 1903, was cut after removal of panel mold.

The architect of the building was R. A. Johnson and the contractor George B. Low, both of Halifax, N. S.

CONCRETE ARCHES FOR RAILROADS.

The extensive use of monolithic concrete for railroad structures is exemplified by the photographs of a number of arches and piers which we are enabled to present through the courtesy of the Chicago Portland Cement Company, whose AA Chicago brand of Portland cement was used.

The first plate shows a concrete culvert of twenty feet span at Bloomington, Ill., under a single track of the Illinois Central railroad. The writer recently inspected this structure, the trestle having been filled since the photograph was taken, and found it in excellent condition. There were a very few indications of surface cracks, which seem to have occurred where changes in design were made after the concrete below had been deposited and set. While the surface showed on close inspection the marks of the forms it also showed that care had been taken to reduce these markings to a minimum and, for all bridges except those whose location and purpose require that special attention be paid to ornamentation and perfection of surface, the finish is undoubtedly satisfactory. Cracks on the surface, due to changes in temperature, have not yet had time to develop, the arch being little more than a year old.

The second and third plates show the standard 20-foot arch and wing walls of the Illinois Central Railroad, this arch being located near Cedar Falls, Ia. The height of the arch from the bottom of foundation to top of coping is 34 feet. The second plate shows an end view of the arch and the third a side view before the fill was made. The length of the arch from face to face is 106 feet and the extreme length of foundation, including the wing walls is 172 feet.

The fourth plate shows another Illinois Central arch over Kane Creek, north of Ripley, Tenn. This arch has 60 feet span. Special mention may be made of the uniform appearance and color of the surface of this structure.

The fifth plate is a view of a part of the approach to the Thebes bridge over the Mississippi River, of steel concrete, a description of which will be found in the August number of Municipal Engineering.

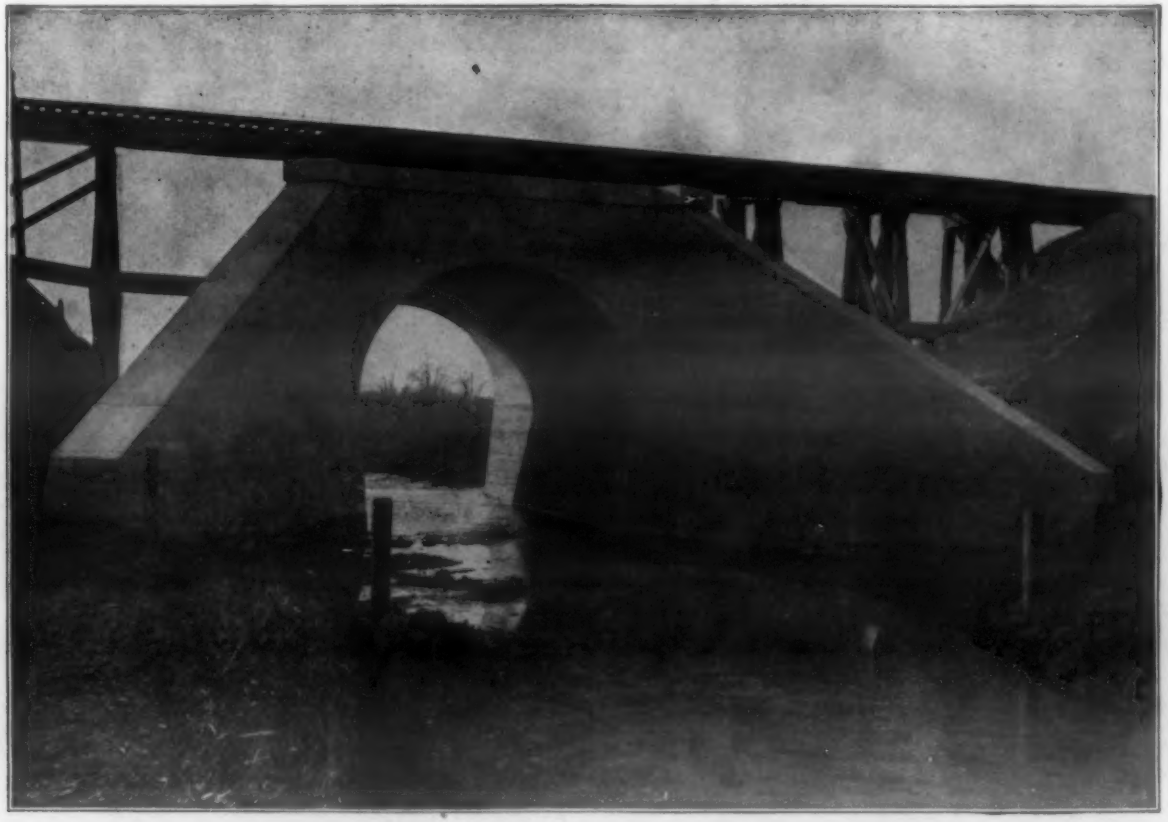
The sixth plate shows the concrete piers, abutments and wing walls of a bridge at Woodland, Ill., on the Chicago & Eastern Illinois Railroad.

HYDRAULIC LIMES AND GRAPPIER CEMENTS.

By Edwin C. Eckel, Asso. Am. Soc. C. E., U. S. Geological Survey, Washington, D. C.

Before taking up the subjects of natural and puzzolan (slag) cements, which will be discussed in later issues of Municipal Engineering, it seems desirable to describe the manufacture and properties of two cementing products closely allied to the natural cements. The two products in question are hydraulic limes and grappier cements. Both are important cementing materials, particularly in Europe. Neither is at present manufactured on a large scale in this country, but some of our "natural cements" differ very little from the European "hydraulic limes," while several plants are turning out a so-called "natural Portland" which is closely related to the French "grappier cements."

Hydraulic limes include all those cementing materials whose clinker, after calcination, contains a sufficiently large percentage of silicate of lime (with or without aluminate of lime) to give hydraulic properties to the product; but at



I. CONCRETE ARCH ON ILLINOIS CENTRAL R. R. AT BLOOMINGTON, ILL.

the same time contains normally so large a proportion of free lime (Ca O) that the mass of burned rock will slake on the addition of water.

The commercial advantage of manufacturing material of this type is that, while it is hydraulic, it will slake on the addition of water, thus rendering unnecessary the expensive grinding required by natural and Portland cements. The minimum amount of free lime possible in the clinker is therefore determined by the consideration that it must be present in sufficient quantity to reduce the entire mass of clinker to powder by the force exerted during its own slaking. At the same time no more free lime should be present than is absolutely necessary to accomplish this disintegration; for the hydraulic properties of the material, which depend directly upon the amounts of silicates and aluminates of lime present in the clinker, will, of course, be lessened as the percentage of free lime is increased.

This result may be attained in two different ways, which produce hydraulic limes very different in quality. The first method in question is:

1. By the calcination, at a high temperature, of a siliceous or argillaceous limestone carrying so high a percentage of calcium carbonate (relatively to its content of silica or alumina) as to leave, after all its silica and alumina have been combined with lime, an excess of free lime. Hydraulic limes produced in this fashion are the typical hydraulic limes; and the further discussion of the subject will have reference to such materials only. It is possible, however, to produce a hydraulic lime by another method, as above noted. This second and much less satisfactory method is

2. By the calcination, at temperatures too low to permit perfect combination of the silica and alumina with the lime, of a siliceous or argillaceous limestone less rich in lime than those employed in the first method. In other words, a rock is used which would, under proper conditions of burning, give a good natural cement. If it is burned at too low a temperature to effect this, however, the result will be a hydraulic lime; for the clinker will consist partly of silicate and aluminate of lime, together with notable amounts of free lime, free silica and free alumina. Hydraulic limes produced in this way necessarily carry a very large proportion of absolutely inert material. They are, in fact, simply imperfectly burned natural cements, and will not be discussed further in this connection.

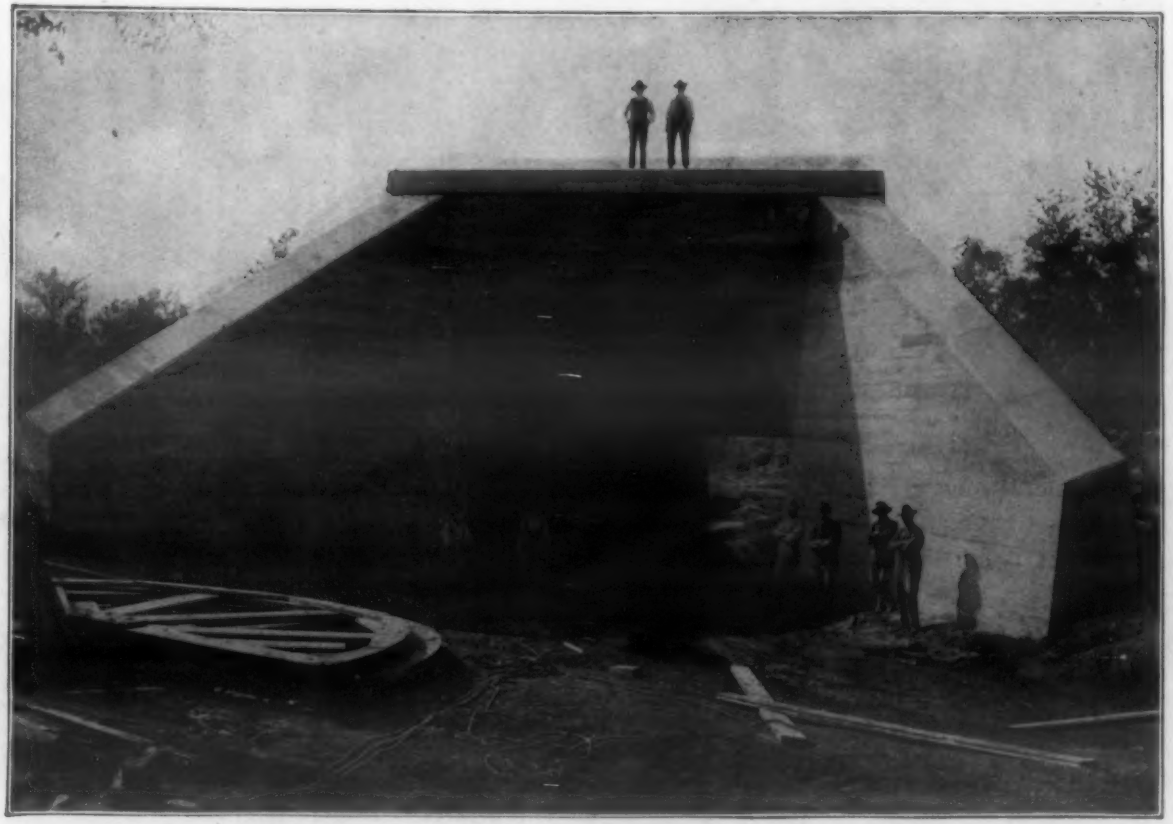
The clinker of an ideal hydraulic lime should, as may be deduced from the preceding considerations, satisfy two limiting conditions. On the one hand it must contain sufficient free lime to disintegrate the entire mass of clinker by the force of its own slaking. On the other hand, no more free lime should be present than is absolutely necessary to effect this disintegration; and no uncombined silica or alumina should be present in the clinker. This ideal condition would be arrived at, according to Le Chatelier,* if we could obtain a clinker containing four equivalents of lime for one of silica. Three of the four equivalents of lime would be united with all the silica to form tricalcic silicate; while the fourth eqivalent of lime would remain free, and would be sufficient to accomplish the disintegration of the entire mass, through the force produced during its own slaking. Accepting this statement, we can calculate the percentages of the various constituents which should be present in an ideal hydraulic lime, both before and after slaking; and also the composition of the limestone necessary to give, in burning, this ideal product. The results of such a calculation are shown in the following table:

TABLE I. COMPOSITION OF IDEAL HYDRAULIC LIMESTONE AND HYDRAULIC LIME.

	Hydraulic limestone	Hydraulic lime	
	Before burning.	Before slaking.	After slaking.
	Per cent.	Per cent.	Per cent.
SiO_2	13.20	21.20	19.08
CaO	86.8	78.80	70.92
CO_2		0.00	0.00
H_2O	0.00	0.00	10.00
	100.00	100.00	100.00

In actual practice, however, it is found that these theoretical compositions cannot be worked up to advantageously. If, for example, a limestone of the composition given above (silica, 13.2 per cent; carbonate of lime, 86.8 per cent) is burned under the ordinary conditions of hydraulic lime manufacture, it is found that all the silica does not combine with three-fourths of the lime, as is required by the theory. What actually happens is that part of the silica will combine with part of the lime

*Trans. Am. Inst. Min. Eng., Vol. 22, p. 16.



II. CONCRETE ARCH NEAR CEDAR FALLS, IOWA. END VIEW.

to form tricalcic silicate, thus leaving a certain amount of uncombined silica and entirely too much uncombined lime. Any increase in the uncombined lime, beyond the amount necessary to cause the clinker to disintegrate by its slaking, lessens the hydraulic value of the product.

It is therefore necessary, in practice, to modify the ideal compositions, there modifications being in the following directions:

(a) Lower lime content. The limestones in actual use, as shown by the analyses quoted in Table II, differ from the ideal hydraulic limestone in carrying from 70 per cent to 80 per cent of lime carbonate, in place of 86.8 per cent of theory. This lowering in the original lime carbonate content of the limestones decreases the amount of uncombined lime in the product.

(b) Presence of alumina and iron. Even the best hydraulic limestones in actual use carry notable amounts of alumina and iron oxide. These constituents act as fluxes, facilitating the combination of the silica and lime. They also combine themselves with lime to form aluminates and ferrites of lime. These latter salts do not increase the hydraulic value of the product, for they become hydrated and inert during the process of slaking, but their formation disposes of some of the excess of free lime.

Analyses of a number of commercial hydraulic limes are given in Tables III and IV.

Manufacture and Properties of Hydraulic Limes—The hydraulic limes are usually compared to Portland or good natural cements, only feebly hydraulic. This fact, taken in connection with the abundance of materials suitable for the manufacture of natural cements, has prevented the introduction of hydraulic lime manufacture into the United States, though in Europe the industry is of considerable importance. No hydraulic lime is at present made in this country, nor is there any prospect that the industry will ever be taken up here. A considerable amount of hydraulic lime and grappier cement is, however, annually imported. This is brought about by the fact that these products, being low in iron and soluble salts, do not stain masonry. There is thus a fair market for them, for architectural rather than for engineering uses. A prominent brand of grappier cement, much used in the United States as a "non-staining cement," is called Lafarge.

The manufacture and properties of the hydraulic limes and grappier cements will be discussed briefly. This discussion will be practically confined to the practice followed at Teil, France, where the largest and best plants are located.

Raw Materials: Hydraulic Limestones—The limestones actually used in the manufacture of hydraulic limes will carry from 70 to 80 per cent of lime carbonate. In hydraulic limestones of the best types, such as are used at Teil, France, the silica will vary between 13 and 17 per cent, while the alumina and iron together rarely exceed 3 per cent. Several analyses of hydraulic limestones are given in table II.

TABLE II. ANALYSES OF HYDRAULIC LIMESTONE.

	(1)	(2)	(3)
Silica (SiO_2)	14.9	15.0	20.10
Alumina (Al_2O_3)			3.52
Iron oxide (Fe_2O_3)	1.7	0.7	2.20
Lime (CaO)	45.63	46.3	40.07
Magnesia (MgO)	0.39	.....	0.64
Carbon dioxide (CO_2)	36.28	37.6	32.19
Water	1.10		0.50

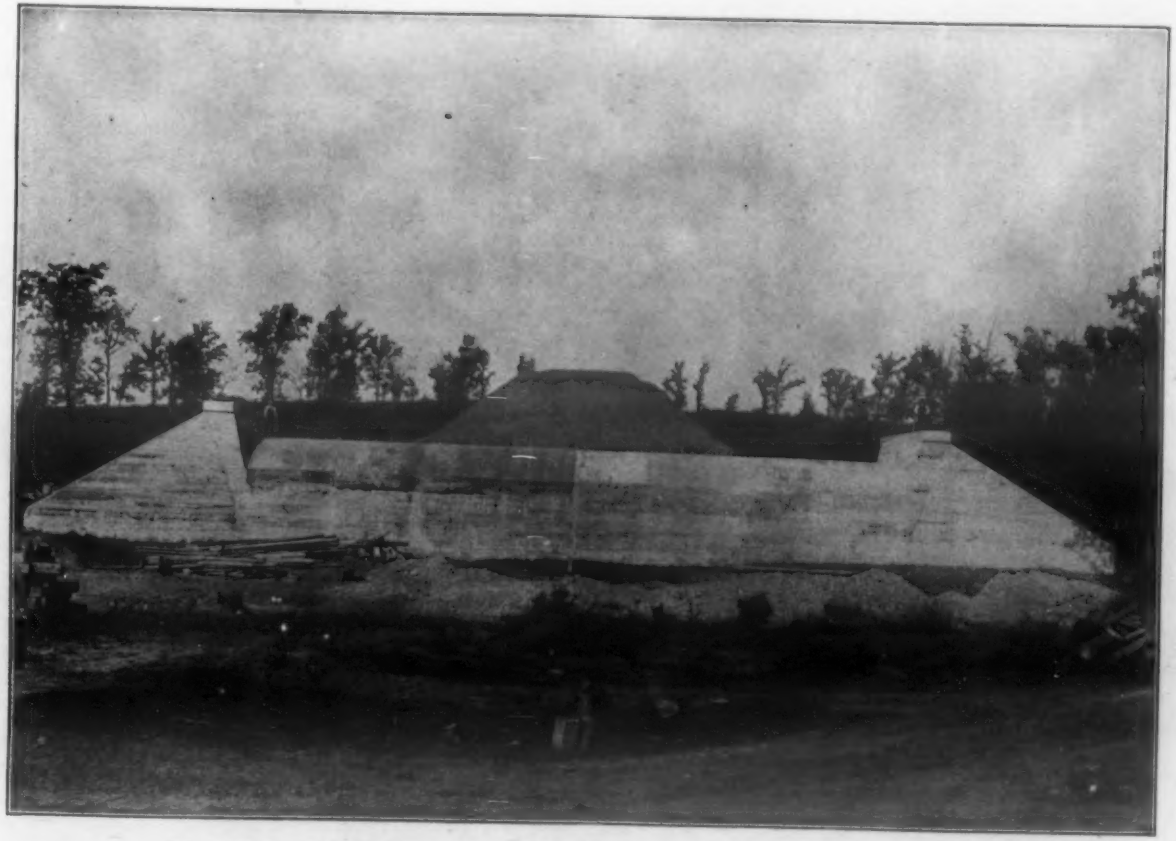
(1). Teil, France. Quoted by Gillmore, "Limes, Cements and Mortars," p. 13.

(2). Teil, France. Rivot, analyst. Quoted by Beckwith, "Hydraulic Lime of Teil," p. 13.

(3). Holywell, England. Blount and Bloxam, "Chemistry for Engineers and Manufacturers," vol. 2, p. 132.

Burning—Hydraulic lime is burned in continuous kilns, like common lime. No difference, in fact, exists between the burning of common and of hydraulic limes so far as the practical operations involved are concerned. The temperature attained in burning is, however, higher in hydraulic lime kilns than in those burning common lime, and the fuel requirements are correspondingly increased. Beckwith states, for example, that at Teil one hundred tons of coal are required to burn stone equivalent to five hundred tons of screened lime. This corresponds to a fuel consumption of 20 per cent by weight on the lime production, which is much higher than the fuel consumption in burning common lime.

In table III will be found a number of analyses of hydraulic limes after being burnt but before slaking.



III. CONCRETE ARCH NEAR CEDAR FALLS, IOWA. SIDE VIEW BEFORE FILLING.

TABLE III. ANALYSES OF HYDRAULIC LIMES, BEFORE SLAKING.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Silica (SiO_2)	26.07	20.57	21.7	26.4	16.05	24.33	29.71	14.17
Alumina (Al_2O_3)	4.38	1.13	1.8	3.0	1.92	3.73	5.35	6.79
Iron oxide (Fe_2O_3)	tr	tr	0.6		3.22	n. o.	3.29	2.34
Lime (CaO)	68.94	77.76	74.0	65.16	77.29	71.94	59.53	63.43
Magnesia (MgO)	0.61	0.54	0.7	1.04	1.52	n. o.	0.95	1.54
Alkalies (K_2O, Na_2O)	.....	.....	.....	.....	n. o.	n. o.	1.17	0.38
Sulphur trioxide (SO_3)	n. o.	n. o.	0.3	n. o.	n. o.	n. o.	n. o.	1.63
Carbon dioxide (CO_2)	n. o.	0.6	n. o.	n. o.	n. o.	n. o.	n. o.	2.64
Water	n. o.		n. o.	n. o.	n. o.	n. o.	n. o.	2.69

(1). Teil, France. Vicat, analyst, quoted by Beckwith, "Hydraulic Lime of Teil," p. 13.

(2). Teil, France. Vicat, analyst, quoted by Beckwith, "Hydraulic Lime of Teil," p. 13.

(3). Teil, France. Stanger and Blount, Mineral Industry, vol. 5, p. 70.

(4). Teil, France. Landrin, analyst, Dict. Applied Chem., vol. 1, p. 483.

(5). Alberthaw, England. Cummings, "American Cements," p. 35.

(6). Lyme Regis, England. Cummings, "American Cements," p. 35.

(7). Holywell, England. Cummings, "American Cements," p. 35.

(8). Holywell, England. Blount and Bloxam, "Chemistry for Engineers and Manufacturers," vol. 2, p. 132.

Slaking—Hydraulic lime, after slaking, is a mixture of two distinct compounds. Part of the mass is composed of lime silicate, which would not slake if water were poured on it, but would from a hydraulic cement if finely ground. The remainder of the hydraulic lime consists simply of quicklime, which will slake with water.

The result of the mixture of the two ingredients is that if water be poured on a lump of hydraulic lime the portion consisting of quicklime will rapidly take up the water and slake. In its slaking its expansion will break up the entire mass into a fine powder. If this operation be done carefully, with just the proper amount of water, the result will be a fine, dry white powder, consisting mostly of lime silicate with about one-third to one-fourth as much of slaked lime.

In the earlier days of hydraulic lime manufacture in France (and even at the present day in England) it was the practice to put the hydraulic lime on the market in lumps, just as it is drawn from the kiln, leaving the work of slaking it to the purchaser. At present, however, the slaking is done at the lime plant in the French works. The advantages of this method of procedure are that (1) the slaking is done more uniformly and carefully, so that the reputation of the lime is improved, and (2) the lime gains considerably in weight and bulk during slaking, so that the cost of slaking is made up.

Slaking should be done with as little water as is compatible with thorough slaking. The lime, as drawn from the kiln, is therefore spread out in thin layers, and lightly sprinkled with water. It is then shoveled up into heaps or into bins, where it is allowed to remain for ten days or so. The slaking is completed while the lime is thus heaped up, by the aid of the steam which is generated.

After slaking is completed, the lime remains as a fine powder, interspersed with lumps (grappiers) of harder material. These lumps consist in part of lime silicate, and in part of unburned or underburned limestone. It would be desirable, if practicable, to remove the latter material, as it is of course valueless as a cement. The lumps of lime silicate on the contrary will, if finely ground, make a good natural cement. This separation is, however, commercially impracticable, and therefore all the grappiers are treated together.

The lime after slaking, is passed over screens (of about 50 mesh). These screens permit all the slaked lime to pass, but reject the grappiers. The lime is sent to the packers, while the grappiers are ground finely under millstones. So far as can be learned, a certain percentage of ground grappiers is always added to the lime, in order to increase its hydraulicity. As later briefly noted the grappiers alone are sold as a cement.

The composition of hydraulic lime of Teil, after slaking, is shown by analyses 2 and 3 of table IV; while analysis 1 is given by Le Chatelier as typical of a good hydraulic lime.

IV. CONCRETE ARCH OVER KANE CREEK, RIPLEY, TENN.

Grappier Cements.—Grappier cements are made by grinding finely the lumps which remain when a hydraulic lime is slaked. These lumps, as earlier stated, consist partly of lime silicate and partly of unburned limestone. The value of the resulting grappier cement will depend on the proportions in which these two ingredients occur in the lumps. If lime silicate forms most of the lumps, the grappier cement will be a very satisfactory material, approximating to Portland cement in its properties. If most—or even a large part—of the lumps consist of unburned limestone, however, the grappier cement will be practically worthless.

Lafarge cement, well known on the American market as a "non-staining" cement, is a grappier cement of very satisfactory composition made at Teil, France

TABLE IV. ANALYSES OF HYDRAULIC LIMES, AFTER SLAKING.

	(1)	(2)	(3)
Silica (SiO_2)	22.0	19.05	18.2
Alumina (Al_2O_3)	2.0	1.6	1.2
Iron oxide (Fe_2O_3)	2.0	0.55	0.8
Lime (CaO)	62.0	65.10	60.0
Magnesia (MgO)	1.5	0.65	1.32
Sulphur trioxide (SO_3)	0.5	0.3	n. d.
Carbon dioxide (CO_2)	0.0	12.45	8.00
Water	10.0		n. d.

(1). Typical hydraulic lime, after slaking. Le Chatelier, Trans. Am. Inst. Min. Eng'rs, vol. 22, p. 16.

(2). Hydraulic lime of Teil, after slaking. Thorpe, Dict. Applied Chem., vol. 1, p. 474.

(3). Hydraulic lime of Teil, after slaking. Gillmore, "Limes, Cements and Mortars," p. 125.

TABLE V. ANALYSES OF GRAPPIER CEMENTS.

	(1)	(2)
Silica (SiO_2)	26.5	31.10
Alumina (Al_2O_3)	2.5	4.43
Iron oxide (Fe_2O_3)	1.5	2.15
Lime (CaO)	63.0	58.83
Magnesia (MgO)	1.0	1.09
Alkalies (Na_2O, K_2O)	n. d.	0.94
Sulphur trioxide (SO_3)	0.5	0.60
Carbon dioxide (CO_2)	5.0	1.28
Water		n. d.

(1). Typical grappier cement. Quoted by Le Chatelier, Trans. Am. Inst. Min Engr., vol. 22, p. 19.

(2). Lafarge cement C. F. McKenna, analyst. Sales agents' circular.

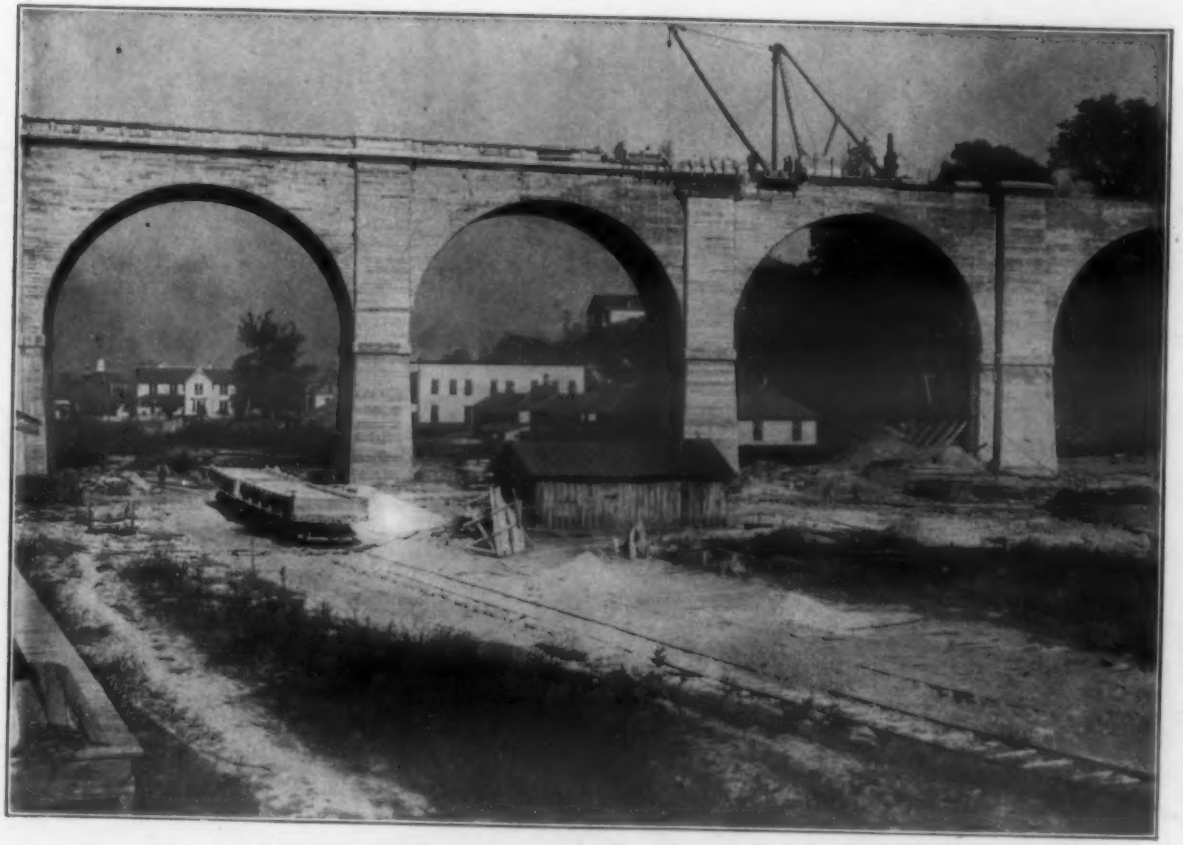
The only data available on the strength, etc., of grappier cements are those contained in the circular issued by the American sales agents of the Lafarge brand. The tests were conducted in 1897 by Dr C. F. McKenna.

TABLE VI. TESTS OF TENSILE STRENGTH, LAFARGE CEMENT.

	1 week	1 month	3 months	7 months	8 months	1 year	2 years
Neat cement, 22½% water, lbs	330	465	500	.....	.....	.....	665
Neat cement, 24% water, lbs	320	.....	.....	542	.....	645	665
1 part cement, 2 parts sand, lbs	145	242	298	.....	470	.....	.....

Specific gravity, not ignited..3.6
Specific gravity, ignited.....3.7
Loss on ignition.....3.83%

Initial set, 4 hours.
Final set, 10 hours.
Fineness, 99.8% through 50 mesh.
99.4% through 100 mesh.



V. APPROACH TO MISSISSIPEI RIVER BRIDGE AT THEBES, ILL.

EDITORIAL COMMENT

An Association for the Cement Block Trade.

State Aid to Road Building in Maryland.

Engineering and Municipal Conventions at St. Louis.

AN ASSOCIATION FOR THE CEMENT BLOCK TRADE.

A correspondent suggests that much benefit might result to the cement block trade through an association of the cement block machine makers. This magazine has often called attention to the damage which is being done to the development of the cement block as a building material by the methods of exploiting machines and the rush to sell machines without reference to the competence and experience of the purchasers. As a consequence there have been some complete failures and in many cases the errors made in learning the business have stopped its development, temporarily at least.

The fact that the material is intrinsically good is more clearly recognized each year and it is only necessary to turn out good work of a high character from the architect's point of view to overcome the prejudices against cement block construction which have been aroused by the mistakes of the past. If the cement block machine makers could get together and devise plans for an organized effort to get the best trade, to which their product is entitled when properly made of proper materials in proper proportions, the advancement of the new material in the markets would be much more rapid.

Every manufacturer has proceeded in his own way heretofore, and as a consequence has found it almost necessary to descend to the plane of the lowest in order to meet the demands for cheapness and rapidity which have come from the claims of machine makers who wanted to get their product into the hands of the purchasers at the earliest possible moment. An association should help to bring order out of this chaos; to elevate the tone of the trade, to sustain methods of showing the advantages of the new material and to bring the makers of good machines into action along the same lines toward this improvement.

Should such an association be restricted to the makers of cement block machines? The machine makers or their agents have been responsible for the placing of the machines in the hands of men new to the cement business, for they have made great points of the simplicity of the processes and the ease with which the business may be learned. They are really, therefore, largely responsible for the many partial and complete failures of some ignorant purchasers of machines, for the retarding of the introduction of the blocks, for the prejudice against them which have resulted. While many of the block makers have found their own way out of the darkness into which they were plunged, there are many others who are still struggling and would be glad to get all the help they can.

These block makers must have the assistance they need and all the block makers must be interested in the campaign for a higher education of the building construction trades if the most rapid advance is to be made. Can these needs be met by making an association to be composed of block makers and block machine makers?

Some organized effort must be made in order to produce the desired improvement quickly and this may be the time to begin it. This magazine offers its services in effecting the organization if it is desired, and asks for suggestions from its readers, first as to the membership and scope of such an association; second, as to the form and method of organization; and third, as to time and place for the first meeting. If the responses to these propositions are favorable an early call for a meeting will be issued and it will be as widely distributed as possible.

STATE AID TO ROAD BUILDING IN MARYLAND.

In April, 1904, the Legislature of Maryland passed a law providing for the appropriation of $200,000 a year to be expended in paying half the cost of road building in the State under certain conditions. The fund is first divided among the counties in proportion to the existing mileage of roads, each county being eligible to receive from $5,137.18 a

VI. CONCRETE PIERS AND ABUTMENTS, C. & E. I. R. R. BRIDGE AT WOODLAND, ILL.

year in Talbot County, to $14,893.89 in Frederick County. Should any county not fulfill the conditions for receiving its share the balance for that year may be distributed among the other counties.

The County Commissioners petition the State Highway Commission for the construction of each piece of road desired. They can be forced to so petition on certain petitions from property owners. The State Commission, if it decides that the road should be built, makes plans, specifications and estimate of cost, and the County Commissioners construct the road by contract or day's labor. On completion according to specifications the State pays the county half the cost, up to half the original estimate. The county must settle land damages independently.

The law goes into operation Jan. 1, 1905, and the highway division of the Maryland Geological Survey is now sending out copies of the law and blank forms of petitions for road plans that the preliminary work may be well in hand before the first appropriation is available.

The county pays the expense of the survey, plans and estimates not exceeding $50 a mile of road and also the cost of supervision of construction. All this work being done by the State Highway Commission.

The roads so constructed are denominated county roads and must be kept in repair. The State Commission notifies the County Commissioners of the need of repairs and they must be made to the State Commission's satisfaction before further appropriations for new roads will be approved. Taxpayers may procure mandamus requiring County Commissioners to act in case they fail to do so.

ENGINEERING AND MUNICIPAL CONVENTIONS AT ST. LOUIS.

The first week in October will be the attractive time for engineers to visit the Louisiana Purchase Exposition at St. Louis.

The International Engineering Congress, held under the auspices of the American Society of Civil Engineers, will meet Oct. 3 to 8, there being general meetings of the Congress on the first and last days and of the various sections on the four intervening days. The general meetings will be held on Oct. 3 and 8 in the convention hall of the Administration Building of the Exposition and the section meetings will be held in separate rooms in that building and its vicinity. There are eight sections which will discuss respectively the following branches of engineering: Waterways, municipal, railroad, materials of construction, mechanical, electrical, military and naval, and miscellaneous. The preliminary program shows from three to twenty-five papers for each section. The subjects of papers for the Municipal Engineering section cover the purification of water for domestic use, sewage disposal and the disposal of municipal refuse, and there are nine papers on these subjects by experts from France, Belgium, the Netherlands and the United States. These are the most interesting questions of the present day in this branch of engineering because the problems which they present have not yet received the fullest study and it can not be said that satisfactory methods of solution have yet been reached. All three of the problems are of vital interest to the cities of this country at this time and their importance and the necessity of better treatment of them are increasing daily as population increases and the magnitude of the interests involved is recognized. The opportunity to hear from the acknowledged experts upon these questions and to question them upon details concerning which more information may be desired should not be missed.

The other sections of the Congress are equally well served, but this section receives special mention here because there are still other attractions to call municipal engineers and municipal officials to St. Louis during the week named.

The American Society of Muncipal Improvements will meet Oct. 4, 5 and 6 at the Grand View Fraternal Hotel, just outside the exposition grounds. The character of this society and the value of its meetings are well known to the readers of this magazine and a program fully equal to those of the past is promised, though it cannot yet be announced definitely.

The League of American Municipalities will hold its annual convention in East St. Louis Oct. 4, 5 and 6. The preliminary announcement of this meeting will be found elsewhere and covers the full line of municipal problems, which will be discussed in the usual manner of this valuable organization from the standpoint of the financial and administrative managers.

The management of the Exposition has named Oct. 6 as "Municipal Day," and a program for that day and others of the week is in preparation with the special aid of the American Civic Association

and with assistance from the other societies mentioned.

A feature of the Exposition is the "Model Street," intended to exhibit methods of city building and decoration. Several cities have contributed buildings to this exhibit and it is proposed to have one or more joint meetings of the societies interested in municipal affairs, to be held in the "Town Hall" on the model street on October 6, "Municipal Day." Some of the subjects to be discussed at these sessions are given elsewhere.

The occurrence of the meetings at the same time and within reach of each other, and the exposition nucleus for joint sessions give an unusual opportunity for the members of the various societies to meet together and to attend each other's meetings and thus learn their likenesses and differences. There has been a continued effort, which has met with some success, to form an alliance of civic organizations, so that the full benefits of all the efforts which are being made toward the betterment of municipal conditions can be secured. The acknowledged differences in field and in methods of the various societies have delayed the recognition by some of the benefits of their co-operation. A joint session or two will clear up some of the misunderstandings by giving fuller information and should show that co-operation of the independent societies will result in benefit to all. A method of securing this co-operation at the same time that the societies remain in their present independent forms has been provided in the organization of the "Alliance of Civic Organizations," whose formation is described elsewhere in this number of Municipal Engineering. A couple of good joint sessions at St. Louis, with proper arrangement for some discussion and presentation of the advantages of the proposed co-operation, will materially aid the cause.

A word by each one interested to the officials of the various organizations will aid in bringing about a closer union. J. J. R. Croes, New York City, is chairman of the municipal section and Charles Warren Hunt, 220 W. Fifty-seventh-st., New York City, is secretary of the International Engineering Congress. Geo. M. Ballard, Newark, N. J., is president, and Geo. W. Tillson, municipal building, Brooklyn, N. Y., is secretary of the American Society of Municipal Improvements. John MacVicar, Des Moines, Ia., is secretary of the League of American Municipalities. Clinton Rogers Woodruff, Philadelphia, Pa., is secretary of the American Civic Association, and John A. Butler, Milwaukee, Wis., has charge of the program for "Municipal Day" on behalf of the Exposition.

THE QUESTION DEPARTMENT

PRICES FOR LABOR.

Can you advise me as to the current wages of common labor and also as to the number of hours worked both by city and contractors' forces in large and small cities? F. F., ——, Texas.

There has been a general increase in the price of labor in all lines for some years, which varies only in detail in various cities. The Bulletin of the U. S. Bureau of Labor for July, 1904, takes up this question and gives the averages for the years since 1890 in all kinds of employment. More detailed data will be given in the eighteenth and nineteenth annual reports of the bureau, this bulletin giving the summaries. The increase is nearly 19 per cent in wages per hour over those in 1894 and is 16.3 per cent over the average for the ten years, 1890 to 1899, both inclusive. At the same time the number of hours worked each week decreased 4 per cent from the time in 1890 and 3.4 per cent from the average in the ten-year period.

General laborers received an average of 14.15 cents an hour in 1896 and 16.76 cents in 1903. They worked 59 hours a week in 1890 to 1892 and 56.13 hours in 1903.

Street and sewer laborers on contract work have had their hours reduced from 59.52 per week in 1891 to 55.32 in 1903, which last is a reduction of 3.8 per cent from the average of the ten-year period.

Wages per hour have been increased from 13.65 cents in 1891 to 20.15 cents in 1903, the latter an increase of 31.4 per cent over the average for the ten-year period Thirty-six establishments reported.

Street and sewer laborers on municipal work have had their hours reduced from 55.15 per week in 1893 to 50.59 in 1903, the latter a decrease of 7.5 per cent below the average of the ten-year period. Wages per hour have increased from 17.86 cents in 1893 to 20.31 cents in 1903, the latter an increase of 11.8 per cent over the average for the ten-year period. Forty seven cities reported.

CLEANING TRACING CLOTH.

Can you tell me of any acid or preparation that will take Higgins's and similar inks out of tracing cloth? Is it practicable to clean soiled tracing cloth by dipping it into gasoline?

OKLAHOMA SUBSCRIBER,
Guthrie, Okla.

Can any of our readers help our correspondent? Trial of gasoline on a small scale would show its effect, which is not satisfactory.

READY RECKONERS.

Do you have any ready reckoners on weights and time keeping and lumber measurements? J. A. L., —, Ill.

The following books are listed in catalogues:

Haswell's "Pocketbook for Engineers" ($4); Hicks's "Builders' Guide" ($1); Hodgson's "Builders' Guide" ($2); Vodges's "Architects' and Builders' Pocket Companion" |$1.50); also English books as follows: Horton's "Complete Measurer" (4s); "Timber Merchants' and Builders' Companion" (3s).

TIMBER PRESERVING PLANTS IN THE SOUTH.

Where in the South are plants for treating timber located? SUBSCRIBER.
Indianapolis, Ind.

The following southern plants are named in a recent report on tie preservation to the American Railway Engineering and Maintenance-of-Way Association:

Creosoting—Norfolk Creosoting Company and Atlantic Creosoting and Wood Preserving Works, Norfolk, Va.; Wyckoff Preserving and Creosoting Company, Portsmouth, Va.; American Creosoting Company, New Orleans, La.; Southern Creosoting Company, Slidell, La.

Burnettizing—Southern Tie and Timber Treating Company., Texarkana, Tex.

Zinc-Tannin Process—Alabama Lumber Company, Alamogordo, N. M.

Various Processes—Texas Tie and Lumber Company, Somerville, Tex., International Creosoting and Con. Company, Texarkana and Beaumont, Tex.; Ayer-Lord Tie Company, Grenada, Miss.; New Orleans Wood Preserving Company, New Orleans, La.

There are also tie treating plants owned by the A., T. & S. F., S. P., M. K. & T. and L. & N. railroads.

WHO IS THE LOWEST RESPONSIBLE BIDDER?

The following is from Livingston, Mont.:

"In the District Court today the injunction secured several days ago, restraining the Mayor and members of the council from making a contract with Ben Hager for the construction of cement walks and curbing in this city, was vacated. It is set forth by John R. King, who asked for the injunction, that in awarding the contract to Mr. Hager, the council give it to the highest bidder and in doing so exceeded their authority. It is contended by the members of the council who voted for giving the contract to Hager, that he was the lowest responsible bidder. The court holds that the members of the council are the judges as to who is the lowest bidder within the advertisement calling for the bids. It is now believed there will be no further opposition to giving the contract to Hager, and it is likely that the contract will be signed up tomorrow."

Where bidders are requested to fill certified checks with their bids, the same being a guarantee of good faith, that the bidder if awarded the contract will execute the required bond within the stated time, etc., it would appear that the certified check, followed by the bond, would be the measure of the bidder's responsibility. He may bid a price at which the work can not be done or will entail a loss, notwithstanding he may execute and complete the contract in accordance with the specifications therefor, and although loser, he may in every sense be a responsible bidder. The question then arises, What is the measure of a contractor's responsibility in awarding contracts?

C. W. SWEARINGEN,
Havre, Mont.

This question is usually stated as in the head line to this article. If the Board of Public Works or the Common Council have the liberty of rejecting any bids or of letting the contract to the lowest responsible bidder, or to the lowest and best bidder, the responsibility for the choice is laid upon them. They are the only judges of the question, and, aside from evidence of fraud, their decision must be accepted. It is even worse

for a city to let a contract at a price below actual cost than for a private individual to do so. The temptation to reduce the loss as much as possible is nearly always too great to make it possible to secure good work unless under the most rigid and continuous inspection.

The principle of getting something for nothing is a bad one and an ignorant or careless contractor who has unquestionably bid below cost may very properly be dropped from consideration. The writer has known good contractors to make mistakes in their bids and to stand by them at a loss, but the inefficient contractor is likely to show his inefficiency in his method of making his bid and the city will lose as much in trouble with the contractor and bad work as it gains over a reasonable cost price. The contract is likely to be a losing one on both sides and such contracts cannot be satisfactory.

There may be honest differences in opinion about the cost of work, or about the difficulties likely to be encountered, and the contractor may have better ways of doing the work than the Council knows of. So it is nearly always a matter of judgment as to whether the price bid is really too low, and the character and reputation of the bidders must be taken into account in determining this. The Board or the Council in the case referred to must exercise this judgment. They cannot be governed by any hard and fast rules. And, in the absence of fraud, their judgment must stand.

There are many city administrations which do not have the power of choice indicated above. They must let the contract, if at all, to the lowest bidder who complies with the conditions. Choice can be exercised under such conditions only by rejecting all bids in the hope that a new letting will result more favorably.

The city may ostensibly be protected by bonds and cash deposits, but the loss in trouble and quality of work is none the less real, though money may apparently be saved in the first cost. Bonds are not evidence of competence. Their office is to protect against incompetence in case the contract is awarded. The best protection against known incompetence is refusal to award the contract. There is enough trouble from incompetence developing after construction has begun without adding to it knowingly and under low bids, which will aggravate its effects.

CONCRETE MIXER.

I purpose going into the manufacture of concrete building blocks. You can probably give me information as to what mixer will be best. I would not want a very expensive one, but one that would mix from 5 to 10 cubic feet at once.

J. E. B., Terrace Park, O.

Reference may be made to the "Business Directory" on another page under the heading "Concrete Mixers," for names of manufacturers of such apparatus. The questions of cost and continuous running enter so largely into the question, when a power machine is required, that they can only be answered by one familiar with the particular case and its requirements. It is quite likely that mixing by hand will be most economical in a small plant, especially if it does not run continuously. Reference may be made to the article entitled "An Inexpensive Concrete Mixer" on page 150 of the August number, in case a machine of small capacity will be sufficient.

ASPHALT PENETRATION APPARATUS.

Please advise us where we can purchase penetration apparatus such as is described in Baker's "Roads and Pavements," or any other apparatus suitable for testing the penetration of asphalt cements.

J. S. D., Ardmore, I. T.

Bowen's penetration apparatus can probably be obtained through Clifford Richardson of the New York Testing Labortory, Long Island City, N. Y. Dow's penetration apparatus can be obtained of A. W. Dow, asphalt chemist, Washington, D. C. These are the principal pieces of apparatus for testing the resistance of asphalt to penetration and are those mentioned by Professor Baker in the book referred to.

COST OF MACADAM REPAIRS, SEWER MAINTENANCE, STREET CLEANING AND SPRINKLING.

I wish to obtain some statistics as to the average cost of macadam street repairs, street cleaning and sprinkling, and the maintenance of sanitary sewer systems in cities having a population of 10,000 to 25,000. I think you have published tables of these data and would like to be referred to them.

J. S., Cincinnati, O.

Not much has appeared which is of practical value upon the question of cost of maintenance of macadam. In vol. viii, p. 51, it is shown that the average for ten years of the cost of maintaining macadam streets in Berlin, Germany, was 19.8 cents per square yard per year. The cost on the various streets varied from 11.2 to 36.5 cents.

With reference to sewer maintenance,

the following articles will be found: North Adams, Mass., catch basins cost 66½ to 68 cents each for cleaning, the haul being about 2,000 feet; vol. xxiii, p. 359. The contract price for cleaning catch basins was 59 cents in Cleveland, according to article in vol. xix, p. 109. In the same article is given a table of cost of sewer cleaning in 22 cities, showing ordinary variations from $12.80 to $211.20 per mile per year, with three cities reporting $5 or "practically nothing" and one $500 to $1,000, the latter evidently for the actual work of removing a stoppage without distribution over the whole system affected. Details of cost of sewer flushing in a number of streets show an average of $196 a mile for 12-inch pipe to brick sewers 4.69 by 3.69 feet. The paper recommends an annual appropriation of $50 a mile a year for cleaning and flushing sewers. Brantford, Ont., averaged about $23 a year for sewer cleaning, including house connections, or $36 to $40 a year for main sewers about 13 miles in length; vol. xiv, p. 144, and vol. xxii, p. 71. The methods of flushing and cost per tank in four small cities are given in vol. xvi, p. 395.

Two large tables giving data on the cost of street cleaning and sprinkling will be found in vol. xviii, p. 201, and vol. xxii, p. 207, which are very full and very convenient. Data about sweeping and sprinkling in some of the larger cities will be found in vols. ix, p. 106; x, p. 121; xii, pp. 170 and 302; xv, p. 385; xvi, p. 384. The cost of street sprinkling in Mankato, Minn., is reported in vol. xii, p. 170, as $265 to $330 a mile of street for the season.

MIXTURE FOR ASPHALT PAVEMENT.

I send you herewith a copy of an ordinance for resurfacing an avenue in this city with asphalt. I am particularly solicitous of that portion of the ordinance that pertains to the mixture that is to be used. What I most wish to know is what proportion of pure asphalt is contemplated in the formula as laid down in the following sections:

"Binder course. That upon the top surface of the aforesaid old concrete foundation so cleaned off and made ready as aforesaid, and upon the top surface of the aforesaid new foundation, when laid and made ready as aforesaid, there shall then be laid down a 'binder course' 1¼ inches thick, which said 'binder course' shall be composed of broken limestone of a size known as 'small concrete' stone, clean and free from dust, dirt and all foreign matter, together with asphaltic cement, which said asphaltic cement shall, in proportion, consist of one part residuum oil and five parts refined asphalt; said refined asphalt to be of the same kind and quality as the refined asphalt hereinafter described as entering into the composition of the wearing surface of the proposed new asphalt pavement; the 'small concrete' stone shall be thoroughly heated to a temperature of 230 to 250 degrees F., and shall then be thoroughly mixed with the asphaltic cement in the proportion of 15 gallons of asphaltic cement to one cubic yard of 'small concrete' stone.

"Wearing surface. That over and upon the aforesaid 'binder course' there shall then be laid down a 'wearing surface' 1¼ inches thick, which shall be composed of 17 parts by bulk of asphaltic cement, 73 parts by bulk of sharp, clean, well-screened sand, free from mud, clay and all foreign matter, and 10 parts by bulk of pulverized limestone; said asphaltic cement being composed of the following-named ingredients in the following-named proportions, viz.: refined asphalt, 5 parts, and residuum oil one part. All refined asphalt shall be of the best quality of refined asphalt obtainable in the market for sheet asphalt paving purposes, and shall be the refined product of the best natural asphaltum deposit, wherever the same may be situated, but the quality of said refined asphalt shall not be inferior to the quality of the best refined asphalt produced from asphaltum obtained from Pitch Lake in the island of Trinidad.

E. W. ——, Ill.

The peculiarity in these specifications is the measurement of the proportions of the materials used in bulk. This is customary with the binder course, but the latest specifications prepared by asphalt experts leave the exact proportions to be fixed by the engineer when the exact quality and size of stone with percentage of voids and the kind of asphalt to be used are definitely known. Some specifications require from one-third to two-thirds more asphaltic cement than the above, but may be defective for some materials, since it is possible to require too much bitumen for a binder course.

The measurement of the proportions in the wearing surface by bulk is in some particulars quite wrong. Thus it is necessary to have from 11 to 13 per cent by weight of bitumen, under the usual definition of that term, in a pavement. It is evident that an asphalt with but 55 per cent bitumen will give the pavement a materially less proportion of bitumen than one with 90 per cent. The above specification does not take this difference into account.

As an example of this, let us assume a sand weighing 100 pounds per cubic foot and powdered limestone weighing 64 pounds. If California asphalt is used, with a specific gravity of 1.25, and the

proportions of the second paragraph of the specifications quoted above are used, the proportions by weight in the mixture for the wearing surface will be 14.3 per cent California asphalt, 78.8 per cent sand and 6.9 per cent limestone dust. If the asphalt is assumed to contain 80 per cent of bitumen, the percentage of this substance in the pavement mixture will be 11.4. In like manner it can be computed that the percentage of Bermudez asphalt (specific gravity 1.08) in the mixture would be 12.6, and of bitumen (asphalt 90 per cent pure) would be 11.3; also that for Trinidad asphalt, specific gravity 1.38 and 55 per cent pure, the percentage of asphalt in the paving mixture would be 15.6 and of bitumen 8.6 per cent.

The California and Bermudez asphalts would supply the proper proportion of pure bitumen for the pavement, while the Trinidad asphalt would supply much less than the proportion deemed necessary for good pavements. The statement of proportions in the specifications should be sufficiently flexible to produce the best result whatever asphalt, acceptable in its characteristics, may be used. There seems to be nothing in the specifications limiting the proportion of pure bitumen in the paving mixture, so that the use of Trinidad asphalt under a strict application of the specifications would be distinctly unfair to that material on account of the low percentage of pure bitumen in the resulting mixture. This disadvantage could be removed if the specification would permit a larger amount of Trinidad asphalt to be used.

Assumption of other weights per cubic foot of sand and of limestone would give other proportions of the ingredients by weight, with the same proportions by volume. Sand may weigh from say 90 to 120 pounds according to whether it is dry or wet, loose or tamped, with even size of grains and large percentage of voids or well mixed sizes of grains and small percentage of voids, and its weight is also affected by its chemical composition. A fixed percentage of sand, whether by weight or by volume, will in general be more likely to be wrong than right, and there should be opportunity provided for change in proportions to suit the exact materials finally decided upon.

In the case of sand of the same physical constitution but with different degrees of compression, the measurement in bulk produces a variation in actual quantities of solids corresponding to the variations in weight of equal volumes of the various samples. The same is true of samples of sand of the same degree of compression but of different weights on account of different proportions of voids, due to variations in uniformity of size of grains. But these variations are so irregular that fixed percentages will fail to produce uniform results, though these results will differ less than those shown in the example of differences in asphalts given above. In this respect measurement in bulk is perhaps as satisfactory as measurement by weight, but neither method of measurement can be reduced to exact percentages applicable to all materials in all conditions. There must be an opportunity to vary the proportions to suit the materials actually used.

The variations in asphalts and in the other ingredients of an asphalt pavement are so great that changes in proportions may be required even from day to day. The laying of asphalt pavements requires expert supervision at all points and at all times.

Reference may be made to Municipal Engineering, vol. xxvi, p. 360, for specifications for asphalt pavements which give the necessary opportunity for variations in proportions by fixing the requirements to be made of the finished pavement, leaving the proportioning of ingredients to such changes as may be necessary to produce the desired result.

PAVING STREET RAILWAY TRACKS.

If a street railway company in the State of Iowa is changing its track on a paved street from a single to a double track, for how many feet in width of paving will said company have to pay, according to section 835 of the code of Iowa, appended hereto, considering the fact that said company has paid already at the time when the paving originally was laid for a strip seven feet wide.

Section 835 reads as follows: Before any street railway company shall lay its tracks upon any street that has been paved and which at the time is not being repaved, it shall pay into the city treasury the value of all paving between its tracks and one foot outside thereof, which value shall be determined by the City Council, but in no case shall exceed the original cost of the paving, and the money thus paid shall be refunded to the abutting property owners on said street in proportion to the amounts originally assessed against the property abutting thereon. A. SCHNELL,

Dixon, Ill.

If the evident intent of the law is carried out, the street railway company should pay into the city treasury the value of the additional area of pavement covered by the doubling of the tracks. Had the double track been laid originally, the street railway company would have paid for a width of seventeen

feet and no sufficient reason appears on the face of the statements in the letter for believing that the payment for the seven feet covered by the single track would relieve the company from payment for the additional ten feet of width covered by the double tracks. Possibly the value of the pavement, as determined by the City Council, would be less at this time than when the single track was constructed. In that case the total payment for the additional area would be proportionately less than for the original area. But if the value of the pavement remains the same, the company should pay for the total area covered by the tracks and one foot outside, less the area with seven feet width already paid for.

The charter provisions regarding maintenance of pavements, and other laws might change this state of affairs, but to one not versed in Iowa law the above seems to be good sense and to conform strictly with the law as stated.

IS CONCRETE FIREPROOF?

The contract is about to be let for the construction of an opera house with concrete stone blocks made with one of the stone block machines. The bricklayers' union has brought up the question as to the stone blocks being fireproof, claiming that they are not. A city ordinance requires that the building shall be fireproof. The contractor intended to use limestone for concrete. The "Hand Book for Cement Users" states that cinder concrete is fireproof, but I do not think it would be strong enough for walls for a large building. An article in "Municipal Engineering" gives the results of an experiment on a stone concrete faced with cinders. Can you cite me to any work treating on this subject.

Are there not reports on the effects of fire on concrete structures in the Baltimore and other fires? If so please let me know where such reports can be had.

J. C. HERRING,
City Engineer, Jefferson City, Mo.

The first question is concerning the definition of fireproof. Brick and stone are usually called fireproof building materials, but their resistance to fire depends upon the intensity of the heat to which they are subjected. Brick will stand a higher temperature than marble or other limestones, but brick of the common kinds used for building will disintegrate or melt if the temperatures are sufficient. All the limestones used in building will disintegrate under temperatures possible in conflagrations, the carbonic acid in combination being driven off and leaving quick lime in place of the limestone. Granite and sandstone are injured or destroyed mainly by physical action in the stone set up by the heat.

In the sense that stone is a fireproof building material, there is no question that concrete blocks are fireproof. If the concrete is made of aggregates which are fireproof, such as pure slag or cinder, the blocks are more nearly fireproof than the ordinary building stones, the cement in the combination being able to resist fire quite as well as any of them, if not better. If the concrete is made with limestone, the blocks are somewhat better than blocks made of the same limestone, if the observations made by Mr. Norton and reported in Municipal Engineering, vol. xxvii, p. 125, August, 1904, are accurate, and the thin disintegrated surface described by him is kept in place as a blanket to protect the inner portions of the blocks. A floor of concrete resists disintegration by fire better than a wall because the retention of the disintegrated surface is more complete.

True cinder concrete seems to be more nearly fireproof than terra cotta, when used in the protection of the steel framing of buildings, not so much because the cinders can resist the chemical decomposition due to the heat better, as because its physical conditions are changed less under the differences of temperature in different parts of the mass, so that, for example, portions of the terra cotta tile will be broken off by the strains due to these differences in temperature, while the less expansion of the cinder concrete and its more favorable shape do not subject it to this danger.

In addition to the article in the August number of Municipal Engineering, the following may be referred to: "Concrete in Baltimore Fire," vol. xxvi, pp. 192, 405. These give the principal conclusions regarding the behavior of concrete in the Baltimore fire. The reports from which they are taken have been published in technical and trade papers and society proceedings

Aside from the observations at the Baltimore fire, but little information has been gathered regarding the action of concrete when subjected to great heat. A few experiments have been made, mainly to show the qualities of certain methods of construction. These have been reported in the papers referred to and can also be found described in some of the advertising literature of the companies interested.

The question of concrete as a fireproof material is a rather new one, the assumption having very properly been that it is as nearly fireproof as the stone of which it is made, but its behavior under great

heat has proven so satisfactory that this property will doubtless be studied more thoroughly that we may know how far the material can be trusted.

WHITE PORTLAND CEMENT AND CONCRETE.

Is there any method or any ingredient to color concrete white? I manufacture tombstones of concrete and dress with cement alone. The color is the only drawback to the business. I find you list chemicals to color all colors except white and that is the color desired in my business. Please suggest a remedy for me.

E. W. A., Hickman, Ky.

Probably the best effect can be secured by using fine crushed white marble instead of sand in the concrete for making monuments. The refuse from marble works or marble quarries, if cleaned thoroughly so that it will contain no dirt, and especially no chips of steel or iron from tools, or, better still, quarry refuse crushed expressly for the purpose, when mixed with cement in proportions of about 1 Portland cement and 4 crushed marble should make a monument of very nearly white marble color. Some Portland cements are whiter than others. Hagloch in his book "Art Stone" ($1.50), gives the following formula for white stone: One part pulverized lime or limoid, two parts Portland cement, two parts pulverized marble, two parts fine washed silica sand, two parts coarse washed silica sand. He mentions Aetna, Dragon, Giant, Nazareth, Phoenix, Vulcanite and Whitehall as brands of Portland cement which he has used successfully in this mixture and says there are still others.

In response to inquiries from our correspondents regarding white Portland cement, Mr. Charles Zunz of Brussels, Belgium, sends us two samples of puzzolan cement which are the nearest approximation to a white color in a hydraulic cement which we have seen. One of these samples has a yellowish brown tinge and the other is a light pearl gray. While these cements are puzzolan, and not Portland, they would probably answer for most purposes for which a white cement is desired, if a pure white is not imperative. The price quoted is $1.19 f. o. b. Antwerp, Belgium, per barrel of 360 to 375 pounds gross weight, with minimum shipment of 60 barrels. Similar cements can be found on the American markets.

Most of the white cements on the market are plasters, which cannot be subjected to the weather as a monument in a cemetery would be. Puzzolan and lime as ingredients of the stone would be open to similar objections, but to a less extent.

CEMENT CHEMISTS.

We believe we have material here to make cement and ask you to kindly give us the address of some expert analyzer of material for cement, also names of manufacturers of machinery and supplies of cement plants.

J. B., Billings, Mont.

Reference may be made to the "Business Directory" published in each number of Municipal Engineering for reliable firms in the lines mentioned. They will be found under the headings, Analyses, Ball Mills, Boilers, Bolting Screens, Castings, Cement Machinery, Cement Mills, Cement Pans, Cement Plant Designers, Chemical Tests, Conveyors, Conveying Machinery, Crushers, Dryers, Friction Clutches, Hoisters, Hoisting Machinery, Laboratory, Lighting Plants, Power Transmission, Rock Crushers, Rope Transmission, Screening Machinery, Shafting, Speed Changes, Stacks, Steel Frame Construction, Tanks, Transmission Outfit, Testing Laboratories, Tube Mills, etc.

The "Directory of American Cement Industries" ($5), the third edition of which has recently been issued, contains many descriptions of cement plants, showing what kinds of machinery are used in various classes of cement plants, and has long lists of the names of manufacturers and dealers in such plants. It also has a good list of those engaged in the designing of cement plants and in the testing and analysis of cement and cement materials.

CONSUMPTION OF PORTLAND CEMENT IN 1903.

Please state the consumption of Portland cement in the United States for the year 1903.

CEMENT MACHINERY CO.,
Jackson, Mich.

The U. S. Geological Survey states in its preliminary estimate of the production of Portland cement in the United States in 1903, issued July 30, 1904, that it amounted to 20,897,973 barrels. The importation during the same period of Portland and other hydraulic cements was 2,044,000 barrels, making a total apparent consumption of 22,941,973 barrels. From this should be deducted 26,700 barrels of foreign cement re-exported, leaving 22,915,273 barrels. To give the true domestic

consumption the amount of domestic cement exported should also be deducted, 285,463 barrels, leaving the net domestic consumption 22,629,810 barrels. These figures are subject to some small corrections since the Treasury Department reports at hand do not distinguish between Portland and other hydraulic cements in giving the figures for exports and imports and not quite all of either are strictly Portland cements.

If reference is made to the article on "The Cement Situation" in Municipal Engineering for March, 1904, vol. xxvi, p. 149, an estimate made by this magazine will be found, giving the probable domestic production of Portland cement in 1903 as 20,700,000 barrels, and the total domestic consumption as 22,417,303 barrels of Portland cement. The latter differs from this latest report by less than one per cent.

CEMENT WALKS OVER AREA WAYS —SIDEWALK LIGHTS.

What do you regard as the best plan for building concrete walk over area ways? If T-rails are used, what weight and at what distance apart should they be placed for a 10 or 11 foot span? Also in what proportions should concrete be mixed?

Can you give me the approximate price of and the best material to use for lighting area ways beneath sidewalks? Also names of firms in Chicago or Minneapolis dealings in such material.

M. S., Missoula, Mont.

Will you please give me the addresses of firms having bulls' eye glass for concrete vaults for sale?

W. F. S., Maquoketa, Iowa.

Detailed answer to the first questions will be found in Municipal Engineering, vol. xxi, p. 160. In short, concrete 4 inches thick, made of 1 part Portland cement, 2 to 2½ parts sand and 4 to 5 parts gravel or broken stone should be sufficient, the bottom being arched by thickening the concrete at the beams. The pocket books of the steel manufacturers give data about the various shapes and sizes of beams from which, with the known weight of concrete and the assumed weight of loads on top and distance between beams, the size and weight of the latter can be found. The local requirements, as well as economy, will influence the choice of beam so that one should know them in order to make a proper choice.

Sidewalk lights, plain and prismatic, can be obtained in Chicago of the American Sidewalk Light Co., Brown Bros. Mfg. Co., Chicago Sidewalk Light Co., Richards and Kelly Mfg. Co., American Luxfer Prism Co., Dauchy Iron Works, and Vierling, McDowell & Co. They can also be obtained of Paxton & Vierling Iron Works, Omaha, Neb., St. Paul Foundry Co., St. Paul, Minn.; P. Richter Iron Works, Denver, Col.; A. Lucas & Sons, Peoria, Ill., and Tucker & Vinton, New York City.

ARTICLES ON CEMENT WORK.

I would like to have numbers of Municipal Engineering telling about cement fence posts, foundations of cement pavements, cause of streaks in cement walk, the effect of water upon the setting properties and tensile strength of Portland cement, and specifications for laying cement sidewalks.

T. R. S., Gladstone, Mich.

The following numbers of the last three or four volumes have practical articles on these subjects:

Cement fence posts; vol. xxvi, pp. 213 and 241.

Foundation of cement pavement; vol. xxv, p. 419, and vol. xxvi, pp. 243, 246 and 321.

Cause of streaks in cement walk; vol. xxiv, p. 434; vol. xxv, pp. 87 and 176; vol. xxvi, p. 320.

Effect of water on setting properties and tensile strength of Portland cement, vol. xxv, pp. 167 and 191.

Specifications for laying cement sidewalks; vol. xxv, p. 419.

Reference may also be made to the "Handbook for Cement Users" ($3.)

MACHINERY FOR PLASTER MANUFACTURE.

Can you refer me to any firms that furnish machinery for the manufacture of gypsum?

D. B. C., Saginaw, Mich.

If machinery for making plaster from gypsum is desired, it can be obtained of the Great Western Mfg. Co., Leavenworth, Kas., and J. W. Voglesong, Elyria, O.

Some of the machinery is made by firms whose names are in the "Business Directory" printed in each number of Municipal Engineering, under the headings Bolting Screens, Cement Machinery, Cement Mills, Conveyors, Conveying Machinery, Crushers, Dryers, Hoisting Machinery, Power Transmission, Rock Crushers, Speed Changers.

If machinery for preparing gypsum for use in mixing with cement is desired, part of the same list of headings may be referred to.

PUMP FOR CEMENT MORTAR.

Some years ago I used a small pump to pump cement mortar into small horizontal places to make the work watertight. I wonder whether there are some improvements in that line, and where the pumps are to be purchased.

E. A. B., Niagara Falls, Ont.

Can our readers give any information concerning improvements in pumps fitting them specially for this purpose? Pumps which can be made to answer can be obtained of the dealers in contractors' supplies in Buffalo and elsewhere. Reference may be made to the "Business Directory" on another page under the heading "Contractors' Supplies."

BOOKS ON PLASTERING.

What book on ornamental plastering would you recommend?

G. W. M., Shelbyville, Ill.

The standard books on this subject are Hodgson's "Plaster and Plastering, Mortar and Cement" ($1); Cameron's "Plasterer's Manual" (75 cents); Kemp's "The Practical Plasterer" (80 cents).

COST OF CONSTRUCTING SEWERS.

Can you refer me to articles in Municipal Engineering showing method of computing cost of excavating for sewers of different size pipe, laying pipe, etc.?

J. P. RYAN, Pottsville, Pa.

Probably the article of most value is one by Emmet Steece on "Estimation of the Cost of Sewer Construction," vol. xxi, p. 406. There is some additional information on the cost of rock excavation on page 403 of the same number. A table giving cost of trenching and refilling for pipe sewers will be found in vol. xviii, p. 110, and some data on the cost of sheeting trenches, vol. xxiv, p. 195. Folwell's "Sewerage" ($3) also gives some instruction on computation of cost of sewers.

REMONSTRANCE AGAINST SEWER.

Can a city of 3,000 population run a small 8-inch sewer through a main street against a remonstrance signed by all the property owners on said street, assessing each lot $50 to $100 to pay for sewer when each lot owner declares he will not use the sewer if he could and could not if he would on account of small size of sewer emptying into tank?

SUBSCRIBER, Butler, Mo.

The first part of this question can be best answered by an attorney familiar with the laws of Missouri. In some states sewers are included with other street improvements and are subject to the same remonstrances and petitions, so that they can be stopped by proper action of the property owners at the proper time. In many states, however, exception is made of sewers, and they can in very many cities and towns be forced through as public necessities, no matter what objection citizens or property owners may make to them. Sewers often being essential to the continued healthfulness of a town, this provision is very salutary and is seldom abused, except that the details may not be properly carried out.

The latter part of the question seems to say that the objection to the sewer is not so much to the idea of the sewer as to the plan on which it is to be constructed. The proper remedy is, therefore, not to stop the construction of the sewer, if that is possible, but to take steps to have it constructed properly. City officials are usually reasonable men, and if they can be shown by competent authority in which they can be induced to have confidence that a certain plan is not good or that another is better, they will be very glad to govern themselves accordingly. An elected city official is very likely to think that the fact of his election puts him in position to know how to decide municipal questions better than his unofficial neighbors, so that expert engineering advice is more effective than the remonstrances of his neighbors. The city officials are doubtless correct in their position that something must be done to sewer the street in question, and they may be wrong in their plans for doing it. If this is the case, it will be well to find out from competent authority what is the best plan and present this to them. They may possibly be induced to call such authority in consultation themselves since it is in reality their own duty to put themselves right.

Perhaps the city officials are right in their plan and the remonstrators are not as well informed as they should be before making their objections.

GARBAGE DISPOSAL PLANTS.

Will you send me information regarding a garbage disposal plant?

E. L., ——, N. Y.

There are two principal methods of garbage disposal, in one of which as much of the valuable material in the garbage is saved as it is possible to remove, and in the other everything is burned up as completely as possible. Some designers of

the latter class of plants utilize as much of the heat as possible in the generation of steam for power purposes or the heating of water or steam for heating purposes, while others utilize nothing but the ash, and the latter possibly only for filling.

Names of firms using each of these methods will be found in the "Business Directory" printed in each number of Municipal Engineering under the heading of "Garbage Disposal Plants" and communication with them will bring a large amount of valuable information. The following articles in recent numbers of Municipal Engineering are of value:

"Garbage as Fuel for Steam Production," vol. xx, p. 140.

"Utilization of Refuse and Garbage for Fuel in England," vol. xx, p. 170.

A list of earlier articles on the subject in this magazine in vol. xxi, p. 152.

Methods of garbage disposal in many cities of the United States are given in vol. xxii, p. 395.

"The New Garbage Destructor at Toronto, Ont.," vol. xxv, p. 345.

"City Practices in Garbage Collection and Disposal," vol. xxvi, p. 182.

"Waste Utilization," vol. xxvi, p. 230.

"Refuse Destruction in Burnley, Eng.," vol. xxvi, p. 268.

"The Sanitary Disposal of Municipal and Institutional Waste by Cremation," vol. xxvi, p. 28.

"Refuse Destruction at Shoreditch, London," vol. xxvii, p. 39.

USE OF COLBY SEWER COMPUTER.

I have the Colby sewer computer. If it is made to use on small sewers with low per cent. of grade I do not understand how to use it. For instance, if I want to get the capacity of an 18-inch pipe on a grade of 0.1 of 1 per cent I set the point on the slide at 100 on the limb, and that leaves the 18-inch mark on the slide several inches beyond the end of the limb. Is it possible to get the discharge of an 18-inch sewer on a 0.1 of 1 per cent grade with this computer, and if so how is it done?

ROSSE CASE, Marion, Kan.

For gradients less than 1 per cent the 18-inch point will lie beyond the limb if the grade point on the slide is set at the 100 point on the limb. This size should be treated for the low gradients in the same way that sizes less than 18 inches are treated on the slide, i. e., set the grade point at 1,000 and divide the resulting figure for the discharge by 10. This is really what is done for the sizes of pipe inclosed in small circles on the slide and the instructions cover the point. For sizes of pipe from 18 to 30 inches and gradients less than 1 per cent, part of the settings will throw the mark on the slide for size of pipe beyond the end of the limb if 100 is used. In case they do, use 1,000 and divide the resulting discharge by 10, as described above. The instructions with the rule seem to be defective in that they do not cover this set of cases. However, a knowledge of the principles on which the rule is constructed would lead one at once to the method described above.

PURIFICATION OF CONDENSED MILK FACTORY REFUSE.

Kindly send us information as to where we can get articles treating on the subject of sewage filtration. We are looking up the problem of purifying the refuse sewage from our condensed milk factory, consisting of a large volume of water and a small quantity of milk.

E. B. G. Fort Lupton, Colo.

This is a "trade waste" which differs somewhat from ordinary sewage and may not be amenable to the same treatment. This can be determined by chemical examination and treatment on a small scale. Naylor's "Trade Waste" gives some idea of the difficulties met with in treating various kinds of refuse and may be of some assistance, though it contains nothing concerning the refuse from milk factories. Such books as Dibdin's "Purification of Water and Sewage" ($6.50), Rideal's "Sewage" ($3.50), Rafter & Baker's "Sewage Disposal in the United States" (1894) ($6), would give much assistance in selecting methods of purification to be tested by experiments upon the liquid to be treated. The following articles in Municipal Engineering may also be referred to, among others, as giving still later and more detailed information:

In vol. xxvii, "The Use of the Septic Tank in Ohio," p. 34; "Sewage Disposal at Plainfield, N. J." p. 37.

In vol. xxvi, "Septic Tank at Soldiers' Home, Santa Monica, Cal.," p. 1; "Sewerage and Sewage Disposal at Bedford, Ind.," p. 109; "Filters vs. Contact Beds in Sewage Purification," p. 111; "The Sewage Purification Plant at Eastern Indiana Insane Hospital," p. 178; "Bacteria and the Septic Tank," p. 267; "Farington, Eng., Sewage Disposal Works," p. 358; "Sewage Purification in Iowa," p. 432. A list of plants described in earlier numbers of Municipal Engineering will be found on p. 409.

In vol. xxiv, p. 363, will be found a further list of such articles. These two lists include articles in vols. xvi to xxvi.

CONVERSION OF CREEK INTO COVERED DRAIN.

Our city is contemplating the improvement of a creek by covering or arching the stream. It is about 20 feet wide and the part to be improved is about one mile in length. I should like to know where streams of this width or near this width have been covered, the cost of improvement per lineal foot and the kind of construction. The creek drains an area of about 5,600 acres of clay soil.

T. E. P., ——, Ind.

Can you let me know the best and cheapest way to cover a waterway 7 feet across and with 8-inch walls, 1 foot 6 inches high?

E. J. C., Southampton, N. Y.

These are problems in sewerage and drainage. The latter question could be answered by suggesting concrete steel slabs of proper design to carry the weight which may be put upon the cover, but a full consideration of the best method of making the improvement would put it in the same class with the former question.

If measurements of the maximum flow of water have never been made, approximations can be made by computations from known high water marks, cross sections measured from them and slopes from comparisons of various high water marks. They can also be made by the standard formulas for collection of water from small watersheds, such as the Burkli-Ziegler or the McMath modification thereof.

When the volume and the possible slope are determined the next problem is the selection of a cross section. The amount of money at hand, the possibility of doing the work part at a time as money is available, as well as the economy of various forms of section are local conditions such that what has been done in one city may be far from acceptable as an indication of what may be done in another. It is seldom advisable to make such an improvement by covering the stream only. In fact, the writer's ovservation is that this is very objectionable. If the whole work cannot be done at once, it is ordinarily much better to begin by giving the stream a uniform slope and putting in the bottom of the proposed channel, following this, at once if possible, with the side walls, and later with the cover. This is possible with some modification, even if the circular cross section is accepted as the best. Closing in a stream bed left in its natural condition simply confines and concentrates the objections to the open channel and transfers some of the troubles to other localities without reducing them.

There are many such enclosed stream beds showing all stages of development in design and the disadvantages of inadequate treatment as compared with proper attention to good engineering principles. From Brooklyn, N. Y., to Kalamazoo, Mich., such creeks have received some sort of treatment in cities of all sizes. Data as to cost are difficult to obtain, as the structures are some of them very old, some have grown slowly and some are parts of systems. They would require expert correction to make them applicable to a particular case, and comparison of plans adapted to such case to determine which would be most economical. Albany, Auburn, Amsterdam, Troy, N. Y., Cleveland, O., Indianapolis, Ind., Detroit and Grand Rapids, Mich., Omaha, Neb., are a few cities which occur to mind having similar cases. Nearly every city or town has a larger or smaller problem of this sort. The best results will be obtained from a careful study of the particular problem, perhaps by a specialist in sewerage, without comparison on superficial lines with what other cities have done with or without competent advice.

WATER AND SEWER PIPES IN SAME TRENCH.

What are the principal reasons assigned for prohibiting the laying of water and sewer pipes in the same trench.

SUBSCRIBER, Havre, Mont.

Those which occur first to mind are the following:

The water pipe is most often laid first and it would be very expensive as well as dangerous to the water pipe to lay the sewer under it.

In case the water pipe is laid last or both are laid at the same time this objection does not hold, but the loosening up of the earth in the sewer trench causes unequal settlement and the water pipe will be thrown out of line both horizontally and vertically on this account. This is almost certain to be the case if both pipes are laid with the same opening of the trench. The settlement may easily be sufficient to cause leaks at the joints of the water pipe and even serious outbreaks of water at broken joints.

A leaky water pipe subjects the sewer to the action of the external water, which sometimes causes local settlement of sewer pipes, sometimes washes sediment into the pipes through open joints and, in case of large flow may wash the sewer pipe out of place. This is almost certain to be the case when there is a sudden and

large break in the water main from any cause, the looser dirt in the trench tending to wash out first, any previous leakage increasing the softness of the earth by soaking it with water.

Repairs to sewer or making of connections are made more difficult by the presence of the water pipe in the trench and may be very seriously interfered with thereby.

Breaks in the sewer usually occur from overloading or washing out in storms and they would almost certainly involve the water pipe above in the same destruction.

If the water pipe cannot be laid far enough away from the sewer trench to leave a self-supporting mass of undisturbed earth between the two trenches, it is better to lay the water pipe in a trench adjacent to the sewer trench with enough solid, undisturbed width of bottom to stand any ordinary damage. In case the trenches are opened at the same time this has the appearance of laying the water pipe on a bench or shelf in the sewer trench. The first objection, that of unequal settlement of the earth under the water pipe, is thus obviated and the smaller chances of damage from the other sources named are diminished still more.

CITY CONTROL OF PRIVATE SERVICE PIPES.

Our city requires the use of extra heavy lead pipe in the construction of all services from the main to the meter, which is placed in the basement, and lets out the contract for this service construction, compelling the property owners to pay according to the contract prices. Has the city the right to specify the use of lead service pipe on the private property, and have they the right to let that work by contract? Are there any legal decisions on this point?

J. K., ———, Ill.

In any particular case there may be circumstances which would influence the decision in that instance, but the general principle underlying decisions may be stated as follows:

The supply of water by a company or by a city to a private consumer is a matter of contract, and the customer accepts the service subject to the rules of the system. The meter, whether owned by the consumer or by the city, is an important part of the apparatus for carrying out the contract and it is essential that the pipe be large enough and strong enough to carry the amount of water required at the pressure and with the water hammer possible under the conditions of operation of the plant. It is therefore clearly the right of the city to specify what shall be used up to the meter and how it shall be laid. The fact that so many cities have plumbing regulations indicates that, whether the city or a company operates the waterworks, the city has the right to specify the minimum quality of pipe and workmanship and pass upon the sufficiency of the plan for plumbing throughout the house. It is possible, however, that a water department of a city would not have this full power over all the plumbing in a house unless it were delegated to it by the city council.

The right of the city to put in the pipe to the meter by day labor or by contract and charge the consumer for it is perhaps not quite so clear, but it is still a matter of contract with the patrons of the water service and can be required before the contract is accepted by the officers of the system.

As a public utility, whether under private or public ownership, the courts would doubtless require that all patrons be treated alike, and any failure in this regard would influence the decision in a particular case.

Reasonable rules and regulations of this sort, made by a company are not questioned so frequently as when made by a city water department, perhaps because the fact that the acceptance of the service is in the nature of a contract is clearer in the first case, and again because the American citizen is instinctively jealous of the usurpation of his private rights by governmental officials and often fails to discriminate between what may be classed as governmental acts and what are really services rendered under contract and which, if rendered by any one but a public official, would be accepted without question under any reasonable restrictions. Reference may be made to Municipal Engineering, vol. xix, p. 216, for a legal opinion applicable to this subject, and to vol. xxi, p. 335, for a court decision regarding reasonable charges and discriminations.

No decisions bearing directly upon the question asked are at hand. Can our readers refer our correspondent to any such?

VITRIFIED CLAY VS. CAST IRON PIPES.

I wish to find out if terra cotta pipe has ever been used under considerable pressure as a substitute for cast iron.

J. C. S., Cumberland, Md.

Vitrified clay pipe has been used for water conduits in several instances, such as Amsterdam, N. Y., and Hartford,

Conn. In the former instance one pipe line was subjected at one time for several days to a considerable pressure, amount not stated, which was sufficient to injure the line so much that it has been gradually replaced with iron pipe. In the latter case the greatest head to which any part of the pipe is subjected is about 10 feet, and a few lengths of iron pipe are used at this point, not on account of the head, but from danger of unequal settlement of fill. Reference may be made to Municipal Engineering, vol. xxv, p. 252, vol. xxiv, p. 234, vol. xx, pp. 76, 89, 151 and 355, for some further information. About five pounds pressure seems to be the maximum to which a vitrified pipe line is subjected in practice though, as stated in vol. xvii, p. 84, a section of 6-inch single-strength fire clay sewer pipe breaks only under a pressure of 90 to 120 pounds, and vitrified shale pipe has carried 140 to 180 pounds in 6-inch size and 220 pounds in 12-inch.

CHARGE FOR MAKING WATER TAPS.

Can you give us about what is the average charge for making taps in the various parts of our country?

H. C. T., Elizabeth City, N. C.

The following collection of data, made mainly from the "Manual of American Waterworks" ($3) gives the variations in practice in the United States.

A distinction is made in many plants between taps and service pipes, the former being made usually by the managers of the plant and the latter being laid sometimes by the plant managers and sometimes by plumbers employed by the water consumers. In some cases these plumbers must be licensed by the water company and in others they are not. The distinction spoken of is made as nearly as the data at hand will permit.

Taps are made free in 567 reported cases, a very few making the restriction that the annual rental must be a certain amount to secure free tap.

Taps are made by consumers themselves in 168 reported plants, permit fees of 25 cents to $2 being charged in some cases.

Taps are made by the plant and the expense charged to the consumers as follows:

Amount of charge not stated	27
At $0.25	1
0.50	3
0.75	5
0.75 to $4.00	1
0.90	1
1.00	52
1.00 to 2.00	2
1.25	4
1.25 to 2.25	1
1.25 to 3.00	1
1.50	26
1.50 to 6.00	1
1.75	4
1.75 to 3.00	1
2.00	69
2.00 to 3.50	1
2.00 to 4.00	5
2.00 to 10.00	1
2.10	1
2.25	37
2.50	5
2.50 to 5.00	10
2.75	2
2.75 to 6.00	2
3.00	77
3.00 to 5.00	6
3.00 to 10.00	1
3.25	1
3.35	2
3.50	26
3.50 to 6.00	1
3.65	1
4.00	17
4.00 to 5.00	3
4.00 to 6.00	4
4.00 to 8.00	2
4.25 to 8.25	1
4.50	6
4.50 to 5.50	1
4.50 to 6.50	1
5.00	86
5.00 to 6.00	2
5.00 to 8.00	4
5.00 to 10.00	3
5.75	2
6.00	19
6.00 to 8.00	1
6.00 to 9.00	2
6.00 to 12.00	8
6.10 to 9.11	1
6.25	5
6.50	2
7.00	26
7.00 to 8.00	1
7.00 to 10.00	1
7.00 to 12.00	1
7.50	1
7.50 to 8.50	1
7.50 to 12.50	1
8.00	22
8.00 to 15.00	1
8.25 to 16.25	1
8.50	1
9.00	7
9.50	1
10.00	39
10.00 to 13.00	3
12.00	10
12.25 to 16.50	2
15.00	4
16.00	1
16.50 to 20.00	1
17.25	1
19.20	1
20.00	2
Actual cost	20
Nominal charge	1

Where limits of prices are stated differences in charge are made for different sizes of pipe and in some cases for differences in the pavements cut into.

The following data include both tap and service pipe except as stated.

In 556 cases the plant seems to have made the tap free and the consumer paid for the service.

Taps are made and services are laid free by the plant in 286 reported cases. In some the service is laid to the curb, in some to a fixed distance from the property line, in many to the property or street line and in a very few to a point inside the cellar. In a few cases a charge is made beyond the curb line or property line and the company lays the pipe. This charge may be 25 to 35 cents a foot or more for larger pipe or may be actual cost.

Taps and services are made by the plant and charged to the consumer as follows:

Amount of charge not stated	796
$0.50	1
1.50 to $16.00	1
1.78	1
2.00	3
2.50	1
2.50 and up	3
3.00	3
3.00 to $5.00	1
4.00	2
4.00 iron, $3.00 wood	1
4.00 to $5.00	1
4.00 to $5.25	1
4.50 to $7.00	1
4.75	1
4.80	1
5.00	13
5.00 on 65 ft. street, 10 cents each additional foot	1
5.00 deposit on water rents	3
5.00 to $7.00	1
5.00 to $10.00	7
6.00	6
6.00 to $7.50	1
6.00 to $19.00	1
6.50	1
6.50 deposit on water rent	1
6.50 iron, $10 lead	1
7.00	8
7.00 to $9.00	2
7.00 to $9.50	1
7.00 to $10.00	1
7.00 to $12.00	1
7.50	2
7.50 to $10.00	1
7.50 to $20.00	1
7.65 to $9.80	1
8.00	11
8.00 to $10.00	2
8.00 to $11.00	1
9.00	4
9.00 to $12.00	1
9.50	2
10.00	12
10.00 to 13.00	1
10.50	2
11.00	1
11.00 up	1
11.50 to 17.50	1
12.00	7
12.00 to 20.00	1
12.65	1
13.00	4
13.00 to 15.00	1
14.00	2
14.00 to 20.00	1
14.50	1
15.00	3
16.00	2
18.00	1
23.00	1
20 cents an hour	1
25 cents a foot	1
50 cents a foot	1
55 cents a foot	1
60 cents to $1.05 a foot	1
Half cost	3
Cost	5
Cost less $3 rebate on water bill	1
Cost less 40 cents a foot rebate on water bill	1
Cost plus permit fee	2

Where upper and lower limits of cost are given the variations are made for length of service on account of width of street or location of house, kind of pavement, size of pipe, kind of pipe, etc.

OPERATION OF WATER FILTRATION PLANT.

Will you kindly inform me how to apply alum coagulant to water continuously? How is the quantity regulated? At what point in the filter is it applied?

R. W. F., Hull, Quebec.

From the report on the water purification experiments at Cincinanti by George W. Fuller the following description of the apparatus for applying the coagulant is abstracted:

Two supply tanks were used, one being used as a supply tank while the solution was being made in the other. The solution was prepared by filling the tank slowly, the water discharging into a box on the side of the tank where the chemical was placed. No difficulty was experienced in dissolving the chemical, using about forty-five minutes to fill a fifty-gallon tank. Suitable glass gauges were provided to observe the level of the solution in the tanks. The supply tanks were connected by pipes to the regulating tank. This was a copper tank one foot in diameter and 1.25 feet deep. By means of a piston valve on the end of the inlet pipe, operated by a float, the level of the solution was maintained in the regulating tank within one-fourth-inch and independent of the level in the supply tank. From the regulating tank the solution passed through a one-half-inch pet cock and discharged freely into a funnel on the end of the one-half-inch lead pipe which connected to the inlet of the subsiding basin. The rate of flow was regulated by the pet cock, using

half-hourly observations of the quantity by means of a graduated glass cylinder. As the head in the regulating tank was practically constant there was a maximum variation in rate of flow of about 5 per cent., which seemed to come at times on account of coatings on the brass tubes. This action was cumulative and it was necessary to flush the pet cock about once a week with a free flow of the solution for one or two minutes.

This apparatus was used on filters operated at a rate of about 35,000 gallons a day. The sizes of tanks and pipes and rates of flow depend on the quantity to be filtered, the amount of coagulant which must be used, the available head for the various parts of the apparatus, etc., and can be computed or determined by experiment for any particular case. The filter companies have worked out these details as well as other automatic regulators for all the ordinary sizes of plants. Reference may be made to the Business Directory printed in each number of Municipal Engineering for names of such companies, under the heading "Filtration Plants."

The coagulant is applied before discharge of water into settling tank or into filter if there is no tank.

PUMPING WATER BY ELECTRICITY.

Can you refer us to articles on rates charged for pumping water and on furnishing electric power for pumping water. What reliable companies are making electrically driven pumps?

H. B., ——, Iowa.

Data on cost of pumping water will be found in Municipal Engineering, vol. xiv, p. 142; vol. xv, p. 10; vol. xx, p. 22, giving cost of small power from oil, gasoline, gas and steam, but not electricity; vol. xxi, p. 379, describing the DeKalb, Ill., electrical pumping plant and giving details of cost and charges; vol. xxiv, pp. 366 and 437, giving names of towns using electric power for pumping, adding Fresno, Cal., to the list of such towns; vols. xxv, p. 162 and xxvii, p. 12, describing the Madison, Wis., pumping plant and the new electric pump.

A description of an installation for pumping sewage by electricity will be found elsewhere in this number of Municipal Engineering.

The Jeffrey Manufacturing Company of Columbus, Ohio, makes electrically driven pumps and can probably supply any needs in this line. Doubtless any of the manufacturers of small pumps can fit them to run by electricity.

INDICATOR OF RESERVOIR LEVEL.

In the city water works here the pumping station is a mile from the reservoir and we have no means at hand to indicate the amount of water in the reservoir to the engineer at the station, except a pressure gauge on the pipe there, which is unreliable. Can you tell us of any device that will indicate to the engineer the exact state of the water, and where it may be bought? The reservoir cannot be seen from the pumping station.

C. E. H., Winchester, Va.

The simplest indicator is one in which a float closes an electric circuit at each of a number of fixed points, the current acting upon an indicator in the engineer's room to show the elevation. If there is danger of interference by ice, a pressure gauge, similarly arranged to make an electric circuit at chosen points may be put on the outlet pipe next to the reservoir and protected from frost. Any electrician can rig up the necessary circuit-makers, string the wires and set up the indicator. Dealers in water works supplies, such as the Crane Company of Chicago, Philadelphia and other large cities, can supply the apparatus.

CORRESPONDENCE SCHOOLS FOR BUILDING CONSTRUCTION.

Which is the best correspondence school to take a course in building construction?

F. P., Kenosha, Wis.

Both the International Correspondence Schools of Scranton, Pa., and the American School of Correspondence at the Armour Institute of Technology in Chicago, Ill., have excellent reputations as correspondence schools and either would doubtless give good service.

MINIMUM RATES FOR WATER, GAS AND ELECTRICITY.

Is it universally held by the courts that a minimum rate can be charged on meters by water, gas and electric light companies where the franchise does not mention the fact one way or the other? The franchise provides for making "all needful rules and regulations governing the consumption of water, tapping the pipes and general operation of the water works, and to make such rates and charges for the use of said water as they may determine, provided that said rates and charges shall not exceed 40 cents for each 1,000 gallons of water."

M. C., ———, Miss.

It would seem that under the above provision a minimum charge which would amount to more than 40 cents a thousand gallons must be made as a charge for

meter rent, or for reading and recording the consumption as shown by the meter in addition to the charge for water used. Minimum meter rates are almost universally upheld, as shown in the decisions quoted in Municipal Engineering, vol. xxiv, p. 367. They are in general subject to the contract powers of the water company, and, so long as the form of the charge does not conflict with the franchise or charter provisions and is reasonable it will probably not be interfered with by the courts.

ORDINANCE GOVERNING ELECTRIC WIRING.

What kind of ordinance can be used in a town of about 3,000 inhabitants to restrict the owners of the electric light plant from putting in wires in such way as to be dangerous? I mean especially with regard to the way wires shall be insulated when put through wooden partitions, but would like a general form of ordinance such as has proved practical when passed by cities of similar size.

C. C. H., ——, Kas.

The provisions for control of electric lighting belong properly to the general building ordinance of the city, governing building construction, wiring, plumbing, fireproofing, etc. If there is no such ordinance and one is not desired, the sections regarding wiring could be enacted separately. The city of Indianapolis has recently passed a very comprehensive building ordinance in which the sections regarding wiring read as follows:

Part 28. Electrical Wiring, Etc. Wires to Be Provided With Metal Tags.

Section 262. All wires on roofs or other structures within the fire limits shall be indicated by a metal tag constructed of brass or copper, 16 gauge and not less than two and one-half (2½) inches in diameter, or from tip to tip. Said tags shall also be stamped in letters at least one-fourth (¼) of an inch in height indicating the ownership of wires. Tags indicating the kind of wire to be of the following shapes:

All electric light and power wires to be indicated by a star.

Telephone and other wires to be indicated by an octagonal shaped tag.

Said tags shall be spaced not less than thirty (30) feet on centers.

Sec. 263. All wiring apparatus for electricity to conform with the National Electric Code in existence at the time the building is erected, together with the following additions:

Electrical Work and Wiring Not to Be Used Until Inspected.

Sec. 264. No electric work or wiring for which a permit is issued or required shall be put to use or connected to service wires or any source of electrical energy until inspected and accepted by the Inspector of Buildings.

And when such electric work or wiring is found to have been installed without a proper permit or not in accordance with the provisions of said ordinance the inspector is hereby authorized and empowered to remove the fuses, cut the wires or otherwise render the system inoperative until such permit has been secured from the said Inspector of Buildings, and the work or wiring reinspected and approved by him.

Applications for inspections shall be filed with said Inspector of Buildings in a book kept in his office for that purpose.

Before any electric work or wiring, done under permits hereafter granted, shall be approved or a certificate of acceptance of the same be granted, the said electric work or wiring must be complete; and in the case of electric wiring must, in addition to the other provisions of the said ordinance, comply with the following requirements:

All necessary branch and feeder wires, meter loops, cut-outs, approved cut-out cabinets, switches and other materials and devices to be furnished at the time of the installation and to be installed under the direction of the inspector, that the installation may be complete and ready for connection with the service.

Wires Not to Be Concealed Before Inspection.

Sec. 265. No so-called concealed wiring for which a permit is issued or required shall be lathed over or in any manner concealed from sight until inspected and accepted by the inspector.

Any person having charge of the erection of any building who causes or allows any wiring, for which a permit has been issued or is required, to be covered by laths or other material before the wiring is inspected and accepted, and any electrical contractor who allows his wires to be so covered without having notified the inspector at least twenty-four hours previously, shall be subject to the penalty provided in Section 269 for the violation of this ordinance.

Penalty for Cutting or Disturbing Electric Wires, Etc.

Sec. 266. Any person, except the duly authorized inspector, who shall cut, disturb, alter, or change, or cause to be cut,

disturbed, altered or changed, any machinery or electric wire, cut-out, fuse, apparatus, or material in such manner as to render the same inoperative, defective or not in accordance with the provisions of this ordinance, shall be subject to the penalty provided in Section 269 for violation of this ordinance.

Wires Outside.

Sec. 267. All wires must cross other wires at right angles, or as near at right angles as possible, and must be drawn taut to avoid swinging contacts and a pole or fixture must support the wires as near the point of crossing as possible.

Wires must be at least seven feet above the highest part of flat roofs, and at least one foot above the ridge of pitched roofs over which they pass or to which they are attached. Must be brought below the roof of any building, commence as high up as possible, and be run straight down between and not in front of windows, hoistways, etc., and as near the wall as the character of the service will admit. Must not cross streets or alleys over head below the roof of the lowest building to which they are attached, and service connections from poles to buildings must be run straight across the street or sidewalk and then down on the wall of the building. Must not in crossing pass above or below the wires of another company and not amongst a group of wires.

Wires must not be attached to chimneys nor in any manner interfere with the free use of fire escapes.

No unused loops or connections from electric light or power circuits shall be allowed to remain after being disconnected from the inside wiring of the building, excepting in cases where it is positively known that the service will be required again within three months. When allowed to remain the loop or service connections must be as well insulated and protected as the line itself.

All dead and unused wires and all loops and unnecessary wires which can be removed without interfering with the system must be taken down from their supports and removed at once.

Wires must be removed and renewed whenever the insulation becomes worn, bruised or defective.

Defective Apparatus and Material.

Sec. 268. Any and all dynamos, motors, wires, or other machinery, apparatus or material used for electrical purposes, which in the opinion of the Inspector, shall at any time become defective so as likely to cause fires or accidents or endanger persons or property, shall be condemned by the Inspector, and upon such condemnation the person or persons owning or using the same shall immediately cause the same to be put in a safe condition.

In case any person or persons owning or using any electric wires, dynamos, motors, or any other electrical apparatus or material of any other nature whatsoever, which have been condemned by the Inspector shall fail to have the same put in safe condition and accepted by the Inspector within forty-eight hours after the same have been condemned, or within such other reasonable length of time as shall be prescribed by the Inspector, then it shall be the duty of said Inspector to remove the fuses, cut the wires or by other means completely disconnect the condemned wires, apparatus or material from the source of electrical energy.

And when any electrical wires, dynamos, motors or electrical apparatus or material of any nature whatsoever have been in any manner disconnected and rendered inoperative by the Inspector, as set forth in the foregoing provisions of secs. 264 and 265, it shall be unlawful for any person or persons to in any manner reconnect the same or cause the same to be reconnected to any source of electrical energy or to use the same as a part of any electrical system until they have been put in safe condition or the provisions of this ordinance complied with and a certificate of acceptance has been issued by the Inspector.

Penalties for violation of the ordinance.

Sec. 269. Any person who shall violate any provision of this ordinance or fail to comply with the foregoing requirements shall be subject to a fine of not less than ten dollars ($10.00) nor more than one hundred dollars ($100.00) for each offense, and may be imprisoned until such fine is paid not exceeding ninety (90) days.

Each and every day's continuance of any violation of said provision of this ordinance shall be and be deemed a separate offense.

Sec. 270. All ordinances and parts of ordinances inconsistent with this ordinance are hereby repealed.

The National Electrical Code referred to contains the rules and requirements of the National Board of Fire Underwriters for the installation of wiring and apparatus for electric, light, heat and power as recommended by the Underwriters' National Electric Association. It has also been approved by the American Institutes of Architects and of Electrical

Engineers, the American Society of Mechanical Engineers, the American Street Railway Association, the Factory Mutual Fire Insurance Companies, the National Association of Fire Engineers and the National Electric Light Association.

The latest edition can be obtained from the National Board of Fire Underwriters, and the code is printed in several books on electrical work, such as Foster's "Electrical Engineer's Pocket Book" ($5). It covers all possible electrical work and provisions for its safety.

Should an ordinance covering all the ground outlined in the code and in the ordinance quoted not be desired, such portions as will suit the local conditions can be selected for incorporation in the regulations

ORDINANCES PROVIDING FOR UNDERGROUND WIRES.

Can you advise me where I can secure a copy of a modern, up to date ordinance, fully protecting the interests of a municipality, requiring that all telephone, telegraph, electric or other wires should be placed underground?

F. M. N., ——, Ia.

The ordinances of the city of Indianapolis have succeeded with as little friction as possible in the placing of electric wires in conduits within the business district and the concentration of wires outside this district very largely into cable lines on fixed routes, thus reducing the overhead lines in all parts of the city to the minimum required for local service.

The first ordinance passed by the city was the following, declaring the poles and wires a nuisance and requiring their removal from the surface within a defined district:

An ordinance concerning telephone and telegraph poles, wires and appliances and matters connected therewith:

Section 1. Be it ordained by the Common Council of the City of Indianapolis, Ind., that the erection or maintenance of telephone and telegraph poles, wires and appliances in the streets, avenues, alleys and public places of said city within the district within said city bounded by North, South, East and West-sts., including said streets and within said streets to the extent the same bound said district, are hereby declared dangerous to life and property, and the continuance thereof for a longer period than reasonably necessary for their abatement and removal without serious detriment to the public uses which they serve, is hereby declared a nuisance.

Sec. 2. On and after one year from the taking effect of this ordinance, it shall be unlawful for any person, co-partnership association or corporation to erect or to permit to be erected, any telephone or telegraph pole, aerial wires or structures, or to maintain or permit to be maintained any telephone pole or poles, aerial wires or structures, already erected, in any of the streets, avenues, alleys or public places of said city within the district or parts of streets designated in the preceding section, unless such poles, wires and structures shall be so erected or maintained in conformity with the provisions of a duly executed contract with said city of Indianapolis by its Board of Public Works and duly approved by ordinance of the Common Council.

Sec. 3. It shall be unlawful for any person, co-partnership, association or corporation to use any of the streets, avenues, alleys and public places within said city for the purpose of laying and maintaining underground conduits for conducting therein telephone or telegraph wires unless first thereunto authorized and empowered by contract with said city executed by its Board of Public Works and approved by ordinance by the Common Council.

Sec. 4. All resolutions and ordinances of the city of Indianapolis, now in force, authorizing and permitting the erection or maintenance of telephone and telegraph poles, wires and appliances in the streets, avenues, alleys and public places of said city within the district and parts of streets designated in Section 1 of this ordinance, in so far only as they conflict with the provisions hereof, are hereby expressly repealed, but nothing herein shall be deemed to repeal any ordinance approving any contract made by said city by its Board of Public Works authorizing the use of any street, alley or public place in said city for any lawful purpose

Section 5. That any person, co-partnership, association or corporation who shall violate any provision of this ordinance, upon conviction thereof, shall be fined in any sum not less than one hundred dollars, nor exceeding five hundred dollars, and each day that any such person, co-partnership, association or corporation shall violate any of said provisions shall constitute a separate offense.

Section 6. This ordinance shall take effect and be in force from and after its passage and publication for two weeks, consecutively, in the ——, a daily newspaper of general circulation, printed and published in the city of Indianapolis, Marion County, Indiana.

In accordance with this ordinance the

Board of Public Works has made contracts with all companies using wires within the city. An example of these contracts as put in ordinance form for approval by the City Council is given below, omitting the space filling legal verbiage. This is one of the simpler contracts, but similar contracts have been made covering the necessary details and following this form as closely as possible with the telegraph, telephone, electric light and power companies. The wiring question is also taken care of in the latest contract with the street railway company. Some of the companies are required to pay the city an annual sum for the privileges granted

An ordinance ratifying, confirming and approving the certain contract or agreement made and entered into on the 28th day of September, 1896, between the City of Indianapolis, by and through its Board of Public Works, and the Postal Telegraph-Cable Company, whereby said company is authorized to construct and operate underground and overhead poles, wires, ducts and appurtenances thereto in, under and along the streets of the City of Indianapolis, Ind., and fixing the time when the same shall take effect.

Whereas, heretofore, to-wit: On the 28th day of September, 1896, the City of Indianapolis, by and through its Board of Public Works, entered into the following contract and agreement with the Postal Telegraph-Cable Company, namely:

This agreement, made and entered into this 28th day of September, 1896, by and between the City of Indianapolis, by and through its Board of Public Works, and the Postal Telegraph-Cable Company witnesseth:

First, that the party of the first part, through the Board of Public Works, does hereby authorize and empower the said party of the second part to construct and lay conduits for wires underground, under the streets, avenues, alleys and public places of the City of Indianapolis, and the right to purchase or lease from any low tension electric company which shall have heretofore obtained or may hereafter obtain, the right from the City of Indianapolis to construct conduits for underground electric conductors in any of the streets, avenues, alleys and public places of the City of Indianapolis, any duct or ducts to contain such wires, cable or cables as may be necessary for the transaction of said second party's business, and to comply with the requirements of this contract to furnish the City of Indianapolis with four conductors, as hereinafter provided, as follows, to-wit: (The location of the four conductors is described.)

2. The party of the second part in consideration of the above privileges granted to it fully agrees and hereby binds itself to the following terms and conditions, namely:

A. (To furnish $75 worth of telegraphing on public business and keep the four conduits in repair.)

B. That it will remove from above ground all wires and poles of every kind owned and controlled by it, within the city of Indianapolis, upon North-st., East-st., South-st. and West-st., and all the territory bounded by the same, except such overhead wires as may be actually necessary to connect with its main and sub-offices in the city of Indianapolis, Ind.; all of such overhead wires and poles to sustain them to be constructed in a manner satisfactory to the Board of Public Works of the city of Indianapolis, Ind.; and no overhead wires shall be constructed until the plans for the same shall have been submitted to said Board of Public Works and approved by it; and the construction of such overhead wires shall then be subject to such rules and regulations as the City Engineer of the city of Indianapolis, Ind., may deem necessary.

C. (Describes lines outside the underground district to be taken down and others to be constructed.)

D. The party of the second part promises, agrees and binds itself to give the city of Indianapolis the right to the exclusive use of the top cross-arm on all pole lines erected by it within the city of Indianapolis, and further agrees to erect no pole lines, except after obtaining the consent of the Board of Public Works of the city of Indianapolis, Ind., and at such points and under such conditions as may be prescribed as herein provided.

E. (Wires can be cut in time of fire).

F. (Assumes all risk of damages on account of construction and agrees "to keep its manholes, conduits, ducts and other appurtenances thereto in a safe condition and in such manner as is satisfactory to the Board of Public Works," and provides penalty for failure).

G. (Provides for inspection of construction by city at expense of company).

H. (Provisions regarding protection of work under construction).

I. (Gives city right to order alterations at company's expense).

J. The company, the party of the second part, further agrees to present plans to the Board of Public Works for the work of putting its wires underground at the places herein named, and of making

the changes provided for in this contract, within 60 days after the same has been approved by an ordinance by the Common Council and signed by the Mayor of the city of Indianapolis, and within 30 days after approval of such plans, the company agrees to enter upon the work and prosecute the same without delay, and have such underground work completed, and the surface of the streets restored to the condition in which they were found, and all its poles and wires removed in the underground district herein named, by November 1, 1897, or before, if possible, unless prevented by injunction or other causes over which this company has no control).

K. (Company to defend suits).

L. (Conduits to be not less than three feet under ground and not to interfere with or disturb existing structures).

M. (Other companies may lay ducts in same trench on payment of pro rata cost).

N. (Responsibility for repairs of such ducts to be located by Board of Public Works).

O. (This contract does not enlarge the company's existing rights).

3. (Bond of $15,000 to be filed before beginning work to meet damages and expenses for any failure of company to perform its full duties).

4. (Right of city to sue for breach of contract set forth).

And, whereas, said contract or agreement has been submitted by the Board of Public Works of the city of Indianapolis to the Common Council of said city for its action thereon; therefore,

Section 1. Be it ordained by the Common Council of the city of Indianapolis, Indiana, that the foregoing contract, made and entered into on the 28th day of September, 1896, by the city of Indianapolis, Indiana, by and through its Board of Public Works, and the Postal Telegraph-Cable Company, be and the same is hereby in all things ratified, confirmed and approved; and the said Postal Telegraph-Cable Company is hereby granted the rights and privileges for the time therein mentioned as in said contract and agreement set forth, in accordance with the terms, provisions and conditions thereof.

Section 2. (Ordinance in force after legal publication).

The requirement of contract with the Board of Public Works is peculiar to Indianapolis and a very few other cities. Ordinarily the agreement would be made by the City Council in ordinance form directly with the company. When there is but a single company or the declaration of nuisance is not necessary the whole matter might be taken care of in a single ordinance, instead of the series required for Indianapolis.

COST OF ELECTRIC LIGHT.

Steam coal f. o. b. here costs from $2.40 to $2.60 per ton. The services of an electrician cost $75 a month, ordinary labor (stoker) $40 a month. What should be the actual cost per month per light of producing 75 to 100 32-c. p. incandescent street lights? What should be the actual cost per light per month of producing 4 to 10 1,200-c. p. arc street lights? Both are for public use. The plant is well equipped and expense of installation is not to be considered. The plant carries some 2,000 commercial lights. H. T. B., ——, Mo.

This is a question which can be answered only in a general way unless there is the greatest detail of information. In the volumes of Municipal Engineering will be found much which will be of assistance in forming a judgment. Among the articles which have appeared in the last ten years attention is called to the following, figures being reduced to the terms of the question when possible:

Vol. xxvii, p. 46. Glasgow, Ky., pays $9.71 a month each for 12 inclosed arc lamps on a midnight and moonlight schedule. Other towns with 31 to 72 lamps pay from $6.25 to $8 a month on schedules varying from 2,000 to 4,000 hours a year.

Vol. xxvi, p. 411. Data are given for towns in Illinois, Indiana, Iowa and Kansas. Sterling, Ill., pays $6.66 a month for arc lights on all-night schedule and has 10 lights. Other towns with more lights pay $4 to $10 a month.

Vol. xxv, p. 234. Data on cost of operation and maintenance of municipal plants in Massachusetts are given. They vary from 4 to 9.2 cents per kilowatt hour, or 39 to 89 cents a month for incandescent lights on moonlight schedule. Interest depreciation and profit must be added to this cost. On page 356 it is stated that Illinois towns average $5.64 a month for arc lights.

Vol. xxiv, p. 6. Details of arc and incandescent lighting in Massachusetts and the United States are given. The average price of incandescent lights in Massachusetts in private plants is $1.77 a month and the cost in municipal plants is $1.57. In the United States it is $2.00 in private plants. Again, 2,000 candle-power arc lights average $7.50 a month for a 3,300-hour year in 29 private plants and 1,200 candle-power lights $7.73 in 78 plants. In 25 cities the average cost, with allowance

for interest and depreciation, is $6.24 a month.

Vol. xxiii, p. 162. The average cost of street lighting in Massachusetts towns is given. On page 363 are given the average prices of arc lights in the various States. The average Missouri town pays $6.88 a month for arc lights burning an average of 2,435 hours a year. The total for the United States shows $9.42 a month for 3,020 hours a year.

Vol. xxii, p. 106. Prices in a number of towns in States along the upper Mississippi are given. They range from $4.17 to $10 a month for arc lights and $1 to $2 for incandescent lights in private plants and $3.33 to $5 for arc lights and $1 to $2 for incandescents in municipal plants. On page 322 it is stated that the average price in 121 companies in Iowa is $6.16 for arc lights and $1.66 for incandescents per month. Some data will be found on page 331 in a report by a committee from Worcester, Mass. On page 371 the cost in the Grand Rapids municipal plant is given as $5.40 a month, lamps burning 10 hours and 26 minutes a day. The average price of electric light in the United States is given on page 416 as 12.3 cents a kilowatt hour. The cost in Detroit is analyzed on page 418.

Vol. xxi, p. 76. Averages of a number of towns are given showing that Morristown, N. J., pays about the average, its price being $6.50 a month for 1,200 candle power lights, 12 in number, and $1.67 a month for 25 candle power incandescent lamps, 171 in number.

Many other references might be given, but the above data are fairly representative, and the Morristown rates may be assumed as in general reasonable. Special circumstances will modify the prices in certain cases and the average price can therefore not be assumed as correct unless peculiarities are not found. They may increase or decrease the rate from those stated.

INFORMATION ABOUT GAS PLANTS AND GAS FRANCHISES.

What city in the United States has the most up-to-date plant, and where can I obtain information relative to gas franchises, specifications for construction work, and other data on this subject, with special reference to small cities of about 20,000. C. W. S., ——, Mont.

Opinions would doubtless differ regarding the first question. Perhaps the best method of presenting the subject is to compare statistics regarding city plants. Large and reliable collections of such statistics will be found in Brown's "Directory of American Gas Companies" ($5), and in the report of the United States Bureau of Labor for 1899. A careful study of these data will suggest the points of superiority which each city may have. Unfortunately for this sort of comparison the names of the cities are not given in the United States government publication. Brown's Directory gives full personal data regarding each company.

Brown's "Directory" also contains a good list of books for gas men, some of which give data regarding method of construction. Most of these are English books. Hughes's "Construction of Gas Works" ($2.20), and Newbigging's "Handbook for Gas Engineers and Managers" ($7.50), are two of these books.

As regards franchises, the best gas franchise fixes the amount of capital stock and bonds which may be issued by the gas company (increases should be subject to the consent of the proper city authority or judge of court by proper proceeding and for proper purposes); the residence of a majority of the directors in the city (in some cases two-thirds); the time limit of the franchise; the amount and nature of the bond for performance of contract, with any desired detail of acts forfeiting the bond; prohibition of consolidation with other lighting companies; the date of beginning construction and the amount of such construction which may be required each year. (This is almost always made a fixed amount after the first installation, which becomes too small before the end of the contract. A percentage of the total construction to the beginning of each year, or a gradually increasing amount, would usually be more satisfactory.) Demands of customers which will enforce the construction of new lines; prices for gas to private consumers, which should be subject to regulation at intervals or when certain conditions arise; quality and candle power of gas; free laying of service pipes to property line; free use of meters; connections with house systems of piping at cost; municipal testing of meters and of purity and candle power of gas; (the Massachusetts law puts the cost of tests on the company if the contract requirements are not met, on the city or other complainant if they are met.) Methods of making cuts in streets and repairs to be under the control of the city engineer and done to his satisfaction; refusals of company to make repairs properly to authorize the city to do the work and collect the full cost of the company by suit if necessary; reductions in price of gas when improvements in

methods of manufacture warrant them; taxes on mains or on receipts.

Proper municipal control of the capitalization, restriction of profits to reasonable percentage, rates for gas and reduction or increase in them would require that the franchise contain a provision that annual reports of operations be made to the municipality in detail. Such reports are required by the Massachusetts law to be made to a State board which has the control of the matters named. In absence of such a State board the city may well assume the right.

A contract for furnishing the city with public light may or may not be included in the franchise. With the provisions for revison of rates noted, it may be included, especially if the provisions needed to make them fully effective are also embodied therein. Contracts for public light are frequently made from year to year independently of the company's franchise. Under the changing conditions in the lighting business short term contracts are best, though those made for longer periods sometimes result in lower prices at the time of letting. It seems to be the general opinion that five years should be the limit of time for such contracts and three years is more often considered the proper time when the best interests of both city and company receive consideration. In very many cases annual contracts are satisfactory and under the decisions upon charter provisions and laws in some states longer contracts are not permitted.

ROADS AND PAVEMENTS

Dustless Highways—St. Joseph Paving Contract—Automobiles on Macadam Pavements—Winnipeg and Detroit Asphalt Plants—Everett Bridge Contract—Bitulithic—Davenport Pavement—Oiled Streets—New Bridges for Indianapolis.

Dustless Highways.

How to obtain dustless highways has long been a problem to which municipal supervisors in all parts of the world have been devoting a great deal of attention. An official report of the department of bridges and roads in France shows the continuance of good results obtained in rendering roads free from dust by coating the surface with tar. The engineer for the Seine and Marne departments reports that after an unsuccessful trial of a mixture of oil a coating of tar was in the summer of 1902 laid down on seven different lengths of road. After carefully observing these roads during the period of twelve months he finds the dust and mud have wholly disappeared, and the cost of maintenance of the roads has been considerably reduced. Further comparing the previous outlay on the roads with that of those with tarred substance he says: "It appears that the tarring method requires no greater outlay and at the same time very considerably improves the condition of the roadway. In La Cher two lengths of the Chaussee Nationale were coated with tar in June and August of 1902. Both these experiments have been entirely successful, the road now being covered with an elastic skin, while the sound of foot passengers' tread is muffled and horses and oxen require only one-half of effort they put forth before. The noise and vibration caused by vehicular traffic is much reduced, and neither dust nor mud is formed on the tarred surface."

St. Joseph, Mo., Street Paving Contract Is Valid.

A decision was handed down by Judge A. M. Woodson Aug. 8 overruling the petition for a temporary injunction against the resurfacing of S. Sixth-st., presented by the Union Terminal Railway Company and others, against the city of St. Joseph, Mo., the Board of Public Works and the Phoenix Brick and Construction Com-

pany, which holds the contract. The case grew out of the award of the contract for the resurfacing of Sixth-st., between Atchison and Renick-sts., to the Phoenix Brick and Construction Company over bids which, on their face, were lower. The petitioners claimed that the bid accepted by the Board of Public Works was not the lowest, and that the ordinance under which the contract was let was not legal; that by fraud and collusion the company receiving the contract induced other companies to make high bids, and that the contract as awarded did not comply with the specifications of the ordinance. The attorney for the Phoenix Brick and Construction Company directed the court's attention to the fact that the Board of Public Works is authorized to reject any and all bids; that the board was acting with authority, and perhaps advisedly, in view of the fact that an item of "extra binder" which might allow indefinite increase of cost had been included in the bid of the General Paving and Construction Company, whose bid was the only one lower than that of the Phoenix Company. Affidavits were then introduced to show that the proceedings of the granting of the contract were entirely regular and the brand of asphalt to be used was superior to that required.

In denying the writ Judge Woodson said that there was nothing in the evidence to show that there was anything irregular in the granting of the contract to the Phoenix Brick and Construction Company, as was alleged in the petition.

Destructive Effect of Automobile Speed on Macadam.

A resident of Rockford, Illinois, declares that automobiles are destructive to macadamized streets and that the coming and going of the puff wagon sweeps the earth off the street as cleanly as a broom and leaves the stones exposed. He declares that within two or three years the macadamized streets of that city will be ruined. He attributes the destruction of the streets to the speed of the machines and says that ultimately the council and supervisors will be obliged to regulate the speed of automobiles on city and country roads.

The Municipal Asphalt Plants at Winnipeg and Detroit.

A report has been submitted to the City Council, Neb., by Andrew Rosewater, City Engineer, regarding his investigation of municipal asphalt repair plants. The report is as follows:

Acting under your resolution to investigate asphalt plants and secure data relative to asphalt paving and repairs, I visited Winnipeg, Man., the city where the first municipal plant on the continent was established in 1898, and has been in operation for over five years. I arrived there on July 15 and at once called upon Col. H. N. Ruttan, the City Engineer, who has for nineteen years been in continuous charge of the engineering department, and has had the direction of public works under his control, and through his kind courtesy, I had every facility afforded me to secure data and inspect works and machinery in that city.

The city of Winnipeg has a population estimated between 50,000 and 80,000 at the present time, and that it is among the most progressive of cities, can be evinced from the fact that in 1903 the building permits exceeded four million dollars, and those issued this year, up to July 19, had already exceeded six million dollars. The city owns its own electric lighting plant, water works, stone quarries, asphalt paving plant, an Engel crematory, a Drake mixing machine and engine, and does its own macadamizing and is laying its own cement sidewalks.

The asphalt plant was acquired in 1901 by the purchase of a contractors' plant then in operation there, and has been used as a city plant, doing all the original paving and repairs ever since. This plant has cost, to date, about $17,500, which includes emery stone grinders and improved mixing machinery. It has from 1,000 to 1,500 square yards surface capacity, daily, and from 2,000 to 2,500 yards of capacity, daily, for binder. In connection with the plant is a small laboratory, equipped for analyzing the asphalts and determining the suitable degree of hardness of the mixtures, by penetration, and also the proper grading of sands for the asphalt used. The daily expenses of operating the plant during the paving season are about $59 per day, and the street gang, about $60 per day, the employes of the plant being as follows: One gang foreman, $3; 1 miller, $2.50; 1 timekeeper, $2; 1 engineer, $3.50; 1 fireman, $2.50; 1 mixer, $3; 1 dustman, $2; 1 tankman, $2; 1 feeder, $2; 2 boys, $2; fuel, seven cords of wood, at $4.67 (includes keeping fire at night), $32.69; oil, waste and small stores, $1.80. The average daily expenditure for the street gang is as follows: Five teams at $4.50, $22.50; 1 raker and fireman at $2.75, $2.75; 2 rakers at $2.50, $5.00; 2 tampers at $2.50, $5.00; 2 smoothers at $2.00, $4.00; 4 shovellers at $1.80, $7.20; 2 roller men at $1.80, $3.60; 1 cement sweeper at $1.80, $1.80; 1 grease boy at $1.25, $1.25; 1 laborer at $1.80, $1.80; 1 watchman (night), at $2.00, $2.00; 1 steam roller man at $3.00, $3.00. A superintendent, expert, in charge of the plant and street work, is employed during the working season of each year at $8 per day.

In view of the extreme depth of frost,

which is eight feet below the surface, special precautions are taken to insure a thoroughly dry sub-surface, and this is done by grading a trench across the street two feet deep every twenty-five feet and filling the same with broken stone. Over the surface, and directly under the concrete base, a three-inch layer of broken stone is laid for ballast, and upon this, on residence streets, a four and one-half inch depth of Portland cement concrete base is laid, and on business streets from five to five and one-half inch depth of base is laid. Over this an asphaltic binder one and one-half inches thick, covered with a surface mixture one and three-fourths inches thick, when compacted, is laid, which comprises the entire pavement.

There is no doubt that this form of construction, which was embraced under classes A and B, No. 2 of the Omaha specifications of 1897, is especially adaptable in retentive clay soils, and countries where excessive cold weather is experienced. Although the temperature at Winnipeg remains at long periods through the winter at 40 degrees below zero, the pavement shows but very few cracks, and these may be due to other causes than temperature. From what I learned in reference to procuring asphalts very little difficulty is experienced on account of alleged trusts. Since the city has operated its plant it has used in its work asphalt of nearly every known brand in this country, embracing Bermudez, Venezuela, Trinidad, Alcatraz and Obispo, using almost exclusively what is know as No. 55 Texas Maltha oil residuum sold by the Standard Oil Company, for fluxing purposes.

The largest area paved in one year with this plant, up to 1904 was 82,000 square yards. The average cost to the property owners for asphalt pavements thus laid under the municipal system is about $2.25 per square yard. This includes a charge of 20 cents for future maintenance. As the average age of the asphalt paving thus far laid in Winnipeg is less than four years the maintenance cost for five or ten years cannot yet be determined. Up to this time less than $500 has been expended on repairs and these have mainly been for restoring trench cuts for piping.

A plant of the character used at Winnipeg would cost nearly 25 per cent less in Omaha; in other words, not to exceed $14,000, as a very heavy tariff is charged by the Canadian government on the machinery, which is all purchased in the United States. From my observation, the management of the Winnipeg plant is in no way embarrassed by political or partisan influences in the selection of workmen. The engineer is practically accorded full authority in the direction of this work. This might be one of the drawbacks to a plant of this nature in our city. A further drawback will be found in the law itself. In Winnipeg, Toronto and other Canadian cities the law provides that the engineer of the city must bid for original paving work on behalf of the city, and if his bid is the lowest the city conducts the work by day labor under the engineer's charge, thus precluding combinations of any kind.

Under the laws of this State, as well as of every other, the original paving of streets is required to be done by contract with the lowest responsible bidder, so that unless our present charter is modified, the city can only conduct repair work. Assuming 120 days as a fair average of working days during which asphalt can be laid each year, a plant having a capacity of 500 square yards daily would provide means for repairing 60,000 square yards per annum. The largest area repaired in any one year by the city has been under 20,000 square yards, so that a plant of from 300 to 500 square yard capacity will meet all the requirements of an exclusively repair plant. Limited to that extent, a repair plant for the city of Omaha, with a full equipment of appliances, including rollers, would cost less than $7,000.

The plant at Winnipeg, while meeting the requirements of that city with satisfactory results, is not such as would be desirable if a new plant were to be determined upon.

From Winnipeg I proceeded to the city of Detroit, calling upon C. A. Proctor, formerly of Washington, who is superintendent of the asphalt department of that city. Mr. Proctor very kindly devoted an entire day in extending facilities for examining the Detroit plant and the work that is going on under him. The Detroit plant is an entirely new one, having been designed and built by Hetherington & Berner, who are special designers of asphalt plants, at Indianapolis. This plant has a capacity of 1,500 square yards of two-inch surface topping, daily, with Trinidad asphalt, and from 1,800 to 2,000 yards of Venezuela and California asphalts. The plant cost, complete, with all equipments, $14,000. Detroit, under the laws of Michigan, can carry on both repair work and resurfacing, but no original paving, which involves special taxes. The plant is certainly very economical and contains all the elements of efficiency in operation, as well as space, and when in operation is the cleanest asphalt plant that I have seen. The plant contains no grinding machinery, as the city finds it more economical to buy the stone dust already ground, which is sold at $3.50 per ton. Venezuela asphalt is almost exclusively used at this plant, costing $25.50 per ton, delivered on the track. Broken stone is obtained at 90 cents per ton; sand, f. o. b., per cubic yard, at 56 cents. Whilst at Winnipeg, in order to get proper grading, sand was shipped from two different pits, Detroit secures a very desirable sand, which requires no grading. The flux used at the Detroit works is the residuum of California oil, which is sold at $25.90 per ton, in barrels at Detroit.

Considerable work was being done during my stay, which was excellent in every

respect. The Detroit work is entirely in charge of the superintendent, for whom the city equipped a laboratory, at which an assistant is kept constantly occupied making tests, not only of the city repair material, but also the material which is being used upon the street by the contractors. This is the only way by which the city can be insured against shortage in mixtures of asphalt pavements. Our own experience in this city in tests made elsewhere, of the mixtures used upon our repairs, has shown a shortage of asphalt called for by specifications, of from 10 to 30 per cent, and I have no doubt that the same has been the case in many of the various pavements laid under contract in past years.

Bridge Contract at Everett, Wash., to Be Relet.

We are advised by W. D. Barkhuff, city engineer of Everett, Wash., that the superior court of Snohomish County, Wash., finds that the city council of Everett exceeded its authority in the award of the contract of the Snohomish river bridge to A. C. Goerig, and permanently enjoins the city from entering into said contract; that the city council has never prepared and submitted to bidders a complete detail plan of the proposed bridge for competitive bidding, but did prepare specifications and a general plan and invited proposals accompanied by detail plans from the bidders; that the proposals and plans as filed by the defendant, A. C. Goerig, and accepted by the city, were not according to the general plans as submitted to competitive bidders, therefore there was no competition.

The city will immediately draw complete plans and readvertise. The bridge will be a steel structure with a 230-foot draw and two 124-foot fixed spans, with concrete piers.

Davenport, Ia., Must Pay for Camp McClellan Pavement.

The United States Circuit Court of Appeals at St. Louis, Mo., has handed down a decision in the Camp McClellan Land Company paving case in which the city of Davenport, Ia., in held liable for the costs of the paving in front of the Camp McClellan tract in the eastern boundary of this city and upon which a recent movement was on foot to establish a State park. In 1896 the city of Davenport decided to pave the river road for a distance of 3,100 feet fronting the old Allen estate. The State law in regard to paving says that at least two-thirds of the property owners must give their consent before a street can be paved and in this city, it is claimed, that the property owners positively refused to give their consent. The Allen heirs, who owned this property, opposed it and secured an injunction restraining the city from constructing the pavement. The city went ahead with the work. The entire cost amounted to $14,675, but when it was finished the Allen heirs refused to pay the assessment. The city took the case to the District Court and was awarded a judgment for the entire amount. The Allen heirs carried the case to the Iowa Supreme Court where the decision was reversed on the grounds that the special tax was illegal, null and void. The city then took up the case again on the grounds of equity, leaving the special assessment out of the question and simply suing for the cost of the work. The Allen heirs succeeded in having this suit transferred to the Federal Court at Keokuk, where Judge Smith McPherson again decided in favor of the city. The Camp McClellan Company was then organized and the big tract of land belonging to the Allen estate was purchased for the purpose of converting it into a fine residence addition with parks and boulevards. The land was bought subject to the settlement of the suit and the land company put up a bond of $50,000 to protect the heirs from any further trouble in the shape of litigation regarding the paving. After offering to settle with the city for the original cost of the paving and meeting with a refusal, the land company took the case to the United States Circuit Court of Appeals at St. Louis, where the judgments of all former courts are reversed and the suit ordered dismissed.

Oil on Streets.

A recent number of "Pacific Municipalities" contains a report of a discussion of the use of oil on streets at the convention of the California League of Municipalities in which the following information regarding practice and results in various cities was reported:

Bakersfield, Cal., used over 10,000 barrels of oil on its streets last year. Being in the oil fields the city secures the best oil for the purpose, 12 to 14 degrees Beaume, at about 60 cents a barrel, applied on the streets. The soil is sandy

alluvium and the results are fully satisfactory with no objectionable features. "In our view there is nothing known that equals oil for street building and improving." Hot oil is used at not less than 200 degrees F. In improving a street it is first graded and rounded up and the earth is then settled by applying water. The oil is then applied, the quantity depending upon the material of the roadway. Some blocks require 80 barrels of oil and others as much as 100. A block is 346.5 feet long and the width of the street is about 51 feet. The street surface is then compacted by the use of a tamping roller. The oil penetrates the loose surface some four or five inches. Streets are repaired about once a year. They are plowed and rounded up where they need leveling and about 19 barrels of oil are applied to each block, sandy spots sometimes requiring more oil. The roller is then used to compact the surface. Streets not requiring the leveling are oiled without other work and without previous wetting with water. The oil works into the road about three or four inches.

The finished oil surface compares very favorably with asphalt. The amount of oil must be carefully gauged to produce the right consistency of the mixture of earth and oil to produce the most satisfactory results. The road must be well graded and rounded and drained so that water will not stand on it before it is thoroughly compacted, otherwise the mixture of oil, water and earth will form a mixture of mud, no better, if not worse than the mud of the unimproved road.

Kern City has a soil composed of more or less clay, and results are reported equal to those at Bakersfield

In Sonoma County, with sandy soil, trouble was experienced with rain before streets were compacted and mud was also formed when the amount of oil applied was too great, the trouble continuing even after the application of four inches of additional gravel, when a rain added water to this top layer. Six or eight miles of roads in this county, oiled by the Board of Supervisors, sandy soil, are very successful.

In Sacramento oil has been applied to macadam streets. After the rolling of the newly macadamized street was finished, 37.5 barrels of oil were applied to each block of street and a coating of sand was added to absorb the oil. Too much sand resulted in a mealy surface, which has improved as the surplus sand has been washed away by rains.

Alameda reports similar results.

In San Leandro a macadam street was repaired by regrading, rolling, oiling, graveling twice, oiling again and applying a fine dressing.

In Napa an old macadam street was oiled and a small amount of dirt put on top. The oil penetrated the macadam, the dust nuisance was completely abated and no additional treatment was necessary for more than two years.

On another road part of the two or three inches of screenings with which it was finished had been thoroughly compacted and part had not. The treatment with oil was successful with the former portions of the road, the oil penetrating the macadam about 1½ inches, but where the screenings were still loose they were taken up by the wagons after the oil was applied, and chuck holes were thus formed.

The application of oil to ordinary roads was unsatisfactory in this district. The soil is adobe and unless very thoroughly compacted before the oil is applied is not improved by the treatment.

A city residence street was unsuccessfully treated by ploughing up the street nine or ten inches deep, rolling, rounding and oiling. Streets are now cleaned, oiled and then stirred up with a harrow or cultivator with teeth very close together to a depth of 1 to 1½ inches, and usually covered with a coating of sand, after oiling, and turned open to traffic after a week or so of standing. Within two or three weeks the street is in good condition.

Another street in adobe soil was oiled two years ago for about a half mile. When rains came the street was in very bad condition, but after the rains were over the street worked into good condition again without further attention. Cold oil is used here with good results, though nearly all reports are in favor of the use of hot oil, since it distributes better and is more economical.

Redlands and San Bernardino County have used oil successfully for many years. Sandy soil makes the more permanent road, but clay can be made into a good road if holes or pockets in the surface are filled and packed with a mixture of sand and oil. Occasionally oil is applied three times a year to a well traveled road. In this county the plowing of the road to a depth of ten inches was unsuccessful.

Redwood City has oiled its new macadam streets successfully, but they are

only a few months old. One street was caught by the rains when under construction and was a failure, reconstruction being necessary.

In San Jose a road through different kinds of soil was made uniform by applying three or four inches of sand, then oiling and applying more sand with good results. Heavy loads seriously injure the roads, as they have been built here, using gravel and applying very little sand.

Visalia has a sandy loam soil. A road built last year was plowed up about eight inches deep, rolled, harrowed to a perfect surface, oiled with hot oil from a sprinkling cart, plowed again about four inches deep and compacted with a tamping machine. Though it rained some while the street was under construction it is in good condition thus far. Another winter with its rains is necessary to test it fully.

Mr. White of Chino treats adobe soil by thoroughly compacting it for use as a foundation. A very light coat of oil is put on, followed with a coating of sand enough to make a sand road, more oil and rolling with a heavy roller after it has stood two or three weeks. Adobe is not considered a possible material for the surface of a successful road.

Fresno uses the method in use at Visalia, sometimes dampening the foundation before rolling and oiling and sometimes using no water, according to the condition of the soil. If a street is not thoroughly compacted, is left in a soft condition, when rains come it will become a bed of mud.

Oil with an asphaltum base is said to be the only oil to use, that with the paraffine base giving unsatisfactory results.

New Bridges for Indianapolis.

The winter and spring floods having destroyed nearly all the bridges over White River, Fall Creek and Pogues Run, in the city of Indianapolis, it will be necessary for the city and county to expend within the next two or three years about $1,500,000 to replace them.

There are so many interests involved and the responsibilities have been so much divided that the Civic Improvement Association and later the Commercial Club took up the matter and selected a "Bridge and Stream Improvement Commission" to take up the study of the problem of replacing the bridges under competent engineering advice, full attention to be paid to the architectural possibilities of the bridges as public monuments and to the improvement of the streams throughout their courses within the city limits.

The commission is composed of the County Surveyor, the City Engineer, the park engineer and three prominent business men. It has done good service aiding in the securing of an appropriation of some $850,000 from the County Council for the construction of six of the necessary bridges, and is now engaged in the preliminary studies on which plans for the structures will be based. The official engineers among its membership are making the technical studies pertaining to their various departments and the harmonious action of the commission, together with the confidence in which it is held by the public, promise good results from the engineering and artistic standpoints with due attention paid to economy.

The Engineering Building at the University of Michigan.

The new engineering building which is being erected at the University of Michigan at Ann Arbor consists of a main building and three large wings. The style of architecture is Renaissance. The main building is 57x66 feet and is four stories high and it spans a diagonal walk which passes beneath the building as an arcade fourteen feet wide. A wing 60x174 feet extends west from the main portion, and another 60x213 feet extends to the north At the end of the latter wing is an extension 22x100 feet, and another wing 60x60 feet projects in the direction of the tall power house chimney. The entire building will be heated by direct radiation and ventilated by fans or blowers. Among the important features of the building and its equipment will be the naval testing tank, the compressed air room, the hydraulic laboratory, the cold storage department, steam engine room and electric room. The building will cost $140,000.

WATER AND SEWERS

Knoxville Municipal Water-Works — Voucher Book for City or Town — Water Meters at Maynard — Cincinnati Water-Works Contract — New York Water-Works Taxes — New York Interurban Water Company — St. Mary's Reservoir — Electrical Sewage Pump — North Peoria Sewer Ordinance — Sewer Charge Resisted — Passaic Valley Sewerage Commission.

Knoxville Municipal Water Works Temporarily Enjoined.

The United States Court issued an order Aug. 8 prohibiting the City of Knoxville, Tenn., from taking steps toward building municipal waterworks until application by the Knoxville Water Company for an injunction can be heard. The time set for the hearing of the case is the third Monday in September. The City of Knoxville voted in July to issue $750,000 for the construction of a municipal water plant. The water company then filed suit against the city, alleging that it had a contract with the city whereby it was agreed that the water company should have the exclusive right to furnish water to the city; that in view of this contract the city has no right to construct its own waterworks; that the franchise granted it contains this agreement and that the city has absolutely no right to nullify that contract; if bonds are issued and the work of construction completed the water company will practically be driven out of business

Voucher Book for Combined Water Works and Electric Light Plant.

The following are the headings of the columns of the voucher book of Silverton, Colo., prepared by August Fast, one of the town trustees. The classifications of accounts are shown by the indentions of lines in the printed list:

WATER.
- Construction.
  - Street Mains.
    - Pipe and Lead, Account No. 1.
    - Miscellaneous, No. 2.
    - Labor, No. 3.
    - ——, No. 4.
    - Total.
  - Reservoir.
    - Material, No. 5.
    - Labor and Incidentals, No. 6.
    - ——, No. 7.
    - Total.
- General Expense and Fixed Charges.
  - Salaries and Labor, No. 8
  - Interest, No. 9.
  - Sinking Fund, No. 10.
  - Miscellaneous, No. 11
  - ——, No. 12.
  - Total.
- Maintenance and Repairs
  - Reservoir.
    - Material, No. 13.
    - Labor and Incidentals, No. 14
    - ——, No. 15.
    - Total.
  - Street Mains.
    - Pipe and Supplies, No. 16.
    - Labor and Incidentals, No. 17.
    - ——, No. 18.
    - Total.

VOUCHERS.
- Date.
- Warrant number.
- Check number.
- Ledger folio.
- Amount
- To whom issued.

ELECTRIC LIGHT.
- Maintenance and Repairs.
  - Building, Account No. 19.
  - Steam Plant, No. 20.
  - Electric Plant, No. 21
  - Miscellaneous Machinery and Tools, No. 22.
  - Lines, No. 23.
  - Oil and Waste, No. 24.
  - Coal, No. 25
  - Miscellaneous Supplies, No. 26.
  - Salaries and Labor, No. 27.
  - ——, No. 28.
  - Total.
- General Expense and Fixed Charges.
  - Interest, No. 29.
  - Sinking Fund, No. 30.
  - ——, No. 31.
  - Total.
- Construction
  - Building, No. 32.
  - Steam Plant, No. 33.
  - Electric Plant, No. 34.
  - Miscellaneous Machinery and Tools, No. 35

Lines No. 36.
Total.

MISCELLANEOUS ACCOUNTS.
Salaries, Other Than Water or Light.
Trustees, Acct. No. 37.
Clerk and Treasurer, No. 38.
Police, No. 39.
———, No. 40
Total
Streets and Alleys, No. 41.
Election, No. 42.
Stationery and Printing, No. 43
———, No. 44.
———, No. 45
Health, No. 46
Police Court, No. 47
Public Improvements, No. 48.
Sidewalks and Crossings, No. 49.
Sewer Warrants and Interest, No. 50
Contingent, No. 51.
———, No. 52.
———, No. 53
———, No. 54.
Remarks

The pages have lines for 54 entries and six lines for totals and balances, divided into groups of five by dark lines. Pages are 18½x31½ inches in dimensions and it requires two pages to carry the whole series of columns.

It will be noted that every voucher, with the data regarding its payment, is entered under the classification headed Voucher. It is then distributed where its various items belong under the other headings. The sum of all the other columns is always equal to the sum of the voucher column. Postings are made monthly, cash being credited with the total for the month and the other accounts charged with the footings of their respective columns in the voucher record.

The book is made on the general plan of the books of the American Waterworks Standard Bookkeeping System, but is condensed in the waterworks portion and the pages are extended in width to add the other accounts. The classification of the waterworks and electric light accounts is not objectionably condensed for a small system and the miscellaneous accounts are probably sufficient in extent and detail for a small town where one man keeps all the accounts and but little is done each month in the way of public improvements, but it would soon become necessary to separate these miscellaneous accounts and put them in a separate book, allowing room for more detail when the town grows large enough to go into public improvements to any large extent.

Mr. Fast is to be commended for his excellent work in classifying the town's accounts and his example should be followed very generally. One of the most discouraging features of town and small city government is the lack of care and detail in keeping the municipal accounts. Mr. Fast has shown how to classify them and arrange the books to keep them and it is easy to take his forms or to modify them to suit the local conditions, have a book made and begin the accounts. Once begun it will be far easier to get good work from subsequent clerks or treasurers. The principal advantage will be found in the ability to see exactly what the town is expending and for what it is expended, at any moment. In very few towns is this now possible. The present condition allows much municipal waste. If the example of Silverton is followed the sources of this waste can be located and the first step thus taken toward stopping it.

Effect of Water Meters at Maynard, Mass.

The installation of water meters in Maynard, Mass., has reduced the consumption of water very materially during the last six months and only half of the meters are in. According to George H. Hart, superintendent of the water department, only 20,000,000 gallons of water was pumped during the last six months, while in the previous six months more than 50,000,000 gallons of water was used.

Another Decision in the Cincinnati Water Works Contract Case.

In a decision handed down by Judge Samuel Smith in the case of the United States Construction Company against the water works board of Cincinnati, he held that it was a case where both parties to the contract were mistaken, in that the city, through a misunderstanding of the conditions, misrepresented in its specifications, and the construction company, likewise mistaken, signed a contract for the removal of material other than that which it found when it came to perform the actual work. On these grounds he overruled the city's demurrer, virtually deciding in favor of the construction company. The United States Fidelity and Guarantee Company was sustained in its contention to the effect that it was relieved from liability by the change of contract, made some time ago, claiming the transfer was made without its consent. Under this decision, in case the water works commissioners declined to answer, the result would be the rescinding

of the construction company's contract and the payment under compulsion by the water works board of $49,000, which has been withheld from the money claimed to be due the construction company on its contract. The water works commissioners decided, however, not to accept Judge Smith's decision as final, and instructed the attorneys to file an answer and fight the case.

Suit Against N. Y. Interurban Water Company Dismissed.

Judge Platt in the United States Circuit Court has dismissed the suit brought by George B. Inman against the New York Interurban Water Company, the New York Surburban Water Company, John Doe, the New York City Suburban Water Company, the West End Safe & Deposit Company of Philadelphia and the Atlantic Trust Company to recover stock the complainant declared he owned in the New York and Mt. Vernon Water Company, which, by consolidation in 1892, was merged in the defendant, the New York City Suburban Water Company, and John Doe, by his agent, without consent. After the Mt. Vernon Water Company was merged in the New York City Suburban Water Company the latter mortgaged its property to the Atlantic Trust Company, which foreclosed in 1895, and the waterworks were sold on the judgment. At that time the plaintiff applied to the Supreme Court for permission to intervene, which application was denied. The New York Interurban Company purchased the property and mortgaged it to the West End Safe and Deposit Company of Philadelphia. The plaintiff asked, in his bill, that he be declared the owner of his original stock in the Mt. Vernon Water Company; that the foreclosure be declared void as far as he was concerned; that the defendants be enjoined from mortgaging the property and that the identity of John Doe be disclosed. The plaintiff's holdings in the original Mt. Vernon Water Company amounted to 100 shares, but, owing to the appreciation of the property and the valuable franchises held by the defendant companies, the equivalent value of the original 100 shares at the present time is estimated at many thousands of dollars.

Judge Platt says:

It is settled in law that when the right of a party to specific relief is so encumbered that he cannot assert that right against another until he has removed the encumbrance he cannot include an attempt to get rid of the encumbrance in a suit for specific relief, which he might be entitled to have, if the encumbrance were out of the way. Here the complainant wishes to have the stock first called his own, and then have such action taken as might perhaps be demanded if the stock were his own without question at the time of the bringing of the suit. The position is untenable.

Vandalism at St. Mary's, O., Reservoir.

An attempt was made to dynamite the bulkhead of the St. Mary's reservoir at St. Mary's, O., shortly after 1 o'clock Aug. 23. The charge was placed at the top of the front gates of the lock, with the result that the entire top was torn away and parts of the heavy stone abutments crumbled to dust. The miscreants took advantage of the lower lock gates being out of repair. The charge, however, was laid too near the stone abutments, which caused the force of the explosion to go upward, and this was all that saved the city from being flooded with water. The city lies nearly twelve feet lower than the water level, and a wall of water nine feet deep is standing above the wrecked lock. The St. Mary's reservoir is the largest artificial body of water in the world.

New York Must Pay Taxes on Its Outside Water Works Property.

The New York Supreme Court handed down a decision recently at White Plains, N. Y., in the case in which the city of New York has for three years been fighting the assessments made by a dozen towns in Westchester and Putnam Counties on the reservoirs and water shed property, valued at more than $15,000,000, that the city must pay its share of the taxes except on the aqueduct property. As a result of the decision the city will be forced to pay taxes on its assessment of more than $10,000,000 in the towns of Greenburg, Yorktown, Somers, Mount Pleasant, Cortland and in Putnam County. On account of its tax roll being held up by the court contest Putnam County had to issue $25,000 bonds to pay bills. Judge Keogh, who handed down the decision, said:

Counsel to the corporation requests that the court set out a rule for the guidance of the assessors in the performance of their official duty. This is not practicable nor necessary. The unique character of the property to be assessed and its great value make the rule governing its assess-

ment no different from that governing the assessment of other property. The assessors should, of course, assess each parcel, keeping in mind the extent and nature of the constructions upon it, its relation to the water system of New York city in its entirety, its situation and the uses to which it is put, the approximate cost of reproduction, and then put upon it such a conservative and just value as in their judgment and conscience it warrants and which will be in keeping with the value of other property on the same assessment roll.

Judge Keogh also said:

By an amendment of the Legislature it was the intention to make liable to taxation in the counties in which they were situated all the lands taken by the city of New York for the maintenance of its water supply, including constructions and works thereon and excluding the aqueduct only from such taxation.

An Electrical Sewage Pump.

The business section of Mobile, Ala., is drained by a 36-inch pipe sewer whose outlet is below the level of water in the bay. When there is a heavy rainstorm the sewer, especially when inevitable deposits occur in it, is not large enough to carry all the water. Mr. J. N. Hazlehurst, chief engineer of the Board of Public Works, installed a centrifugal pump with 18-inch inlet and outlet pipes and a capacity of 18 cubic feet a second to relieve the sewer of this storm water, putting in also a gate to cut off connection with the bay while the pump is in operation.

The pump and gate are at some distance from any municipal office or works and as the necessity for their operation is comparatively infrequent, but must be promptly met when it occurs, electrical apparatus for operating the pump and the gate was made use of. An Engberg electro-hydraulic valve with 8-inch cylinder and 36-inch stroke is used to open and close the 36-inch gate valve. This valve is operated by hydraulic power derived from a city water main. The valve admitting water to the cylinder of the hydraulic engine is set in operation by means of an electrical current generated by a battery at police headquarters and turned on by a switch at the same office. An electric alarm rings, upon making of the proper connection, if the motor has been started by closing the switch. It cannot ring until the gate has begun closing, so that any failure to operate is definitely located.

The vertical, submerged, centrifugal pump is operated by a horizontal electric motor connected with it by a bevel gear. It is started by turning on the current at the police station. The lift of the pump is five feet over the bank at high tide.

North Peoria, Ill., Sewer Ordinance Valid.

Judge Slemmons, of the County Court at Peoria, Ill., overruled all objections and declared the city ordinance providing for the completion of the North Peoria sewer system valid, in a decision handed down August 4. Litigation in this matter has covered a period of more than three years. Non-resident property owners, who are interested in the city's welfare as a matter of speculation only, have been the main objectors to the improvement. Notice of an appeal to the Supreme Court has been given.

Charge for Use of Sewer Resisted.

Owing to the decision of the township of Milburn, N. J., to charge them for emptying waste water into the sewer, the officials of the Diamond Mills Paper Company have decided to dismantle their plant in that place and distribute the machinery to other plants. The township committee at first sought to charge the company $1,000 a year for using the sewer. When the company announced its intention to move away the committee decided to charge $10 a million gallons, which would amount to about $50 a year. The company refused to accept this and the plant will be closed down permanently on Sept. 1.

Passaic Valley Sewerage Commission Act Is Constitutional.

The supreme court of New Jersey sustains the constitutionality of the act creating the Passaic Valley Sewerage Commission and its provisions for the construction of a system of trunk sewers from the falls at Paterson to the meadows below Newark, and thence into New York Bay. The case was taken to the supreme court on July 31, 1903, when Chief Justice Gummere granted a writ of certiorari to review the action of the Passaic Valley Sewerage Commission in passing a resolution authorizing the issuance of $1,000,000 of bonds as part of the $9,000,000, the estimated cost of the proposed relief sewer, and another resolution providing for an issue at the same time of $1,000,000 to begin the necessary work. An appeal to the New Jersey Court of Errors is being prepared by the city of Paterson.

MUNICIPAL PROBLEMS AND CONDITIONS

New York Gas Lighting Contract—Eight-Hour and Local Labor Specifications—Support of Home Industries—Fire Test of Concrete-Steel—Chicago Business Conditions—Appropriations for Municipal Improvements—Santa Clara Municipal Ownership.

New York Gas Lighting Contract Sustained.

Justice Gaynor of the New York Supreme Court vacated, Aug. 3, the temporary injunction obtained by Samuel V. Abeel of Manhattan, to restrain John T. Oakley commissioner of water supply, gas and electricity, in New York City, from entering into a contract with the Consolidated Gas Company to light the streets of Manhattan and Bronx at $24.75 a lamp. In his complaint Abeel alleged that the bids for lighting Manhattan and Bronx boroughs were opened March 16, and that the American Street Lamp and Supply Co. was the lowest bidder, but that the only bid considered was that of the Consolidated Gas Co., which, he claims, was excessive. He thought $16 a lamp would be a fair price. Commissioner Oakley asserted that the bid he accepted was the lowest ever secured by the city, and that the present contract, which calls for the lighting of 22,000 lamps, will save the city $80,000. In his opinion, Justice Gaynor says:

The price seems to have been carefully fixed by the exercise of official judgment and discretion after the prescribed routine. That discretion is not reviewable by the courts in a taxpayers' action, and as no fraud is alleged in the complaint the case must fail, there being no illegality. The allegations that the contract is for both Manhattan and the Bronx, or that bids were called for in the territory of both boroughs combined, seems to be a mistake. It is in information and belief only, and the facts seem to be to the contrary.

Local Labor Provision in Allegheny Sewer Ordinance.

Director McIlvaine of Allegheny, Pa., refuses to act in accordance with an ordinance introduced in the councils annulling an ordinance previously passed authorizing the Mayor and Director to advertise for bids for laying about $40,000 worth of sewer mains, principally in the Tenth, Eleventh and Fifteenth wards. A section of the ordinance provides that preference in labor be given to citizens of Allegheny, which, Director McIlvaine says, is contrary to the provisions of the city charter. The measure was bitterly fought in both branches of councils, and failed to pass in the select branch on its first presentation. It was reintroduced, however, on a technicality charging irregularity at the first meeting, and its final passage followed. Mayor Wyman opposed it and since its passage has refused to sign it. As it was passed on July 11 it has become a law without the Mayor's signature. Director McIlvaine contends that it will be imposible to find 300 resident citizens of Allegheny to dig in ditches, and this is the character of the work demanded in such operations as laying water mains. In presenting the bill, John R. Henricks of the Eleventh ward declared that in view of the great number of citizens who had been out of work for months owing to the shutdown in mills and factories, it was a duty council owed these people to give them work when possible.

Director McIlvaine says: "The city charter ordinance provides that all such work, in fact, any work that involves the expenditure of more than $250, shall be advertised and the contract let to the lowest bidder. That seems clear enough, and yet that ordinance puts the responsibility of the work in my hands and restricts me in my choice of the class of labor that can best do the work. The whole thing is illegal, and I am going along with that work as I think best for the interests of the city. If anyone takes exception I shall make a test case of it and have it decided, once for all, what are the powers of councils and the scope of the charter ordinance."

Eight-Hour Day Provision in Milwaukee Contracts Attacked.

Suit has been filed in the Superior Court by the Filer & Stowell Company against the city of Milwaukee, Wis., Mayor David S. Rose, City Treasurer William H. Graebner, City Clerk E. M. Schuengel, City Engineer Charles J. Poetsch, J. V. Schoenecker, Thomas E. Hoye and C. Helms, commissioners of public works, and the William Tod Company of Youngstown, Ohio, to have the action of the board of public works in granting to the William Tod Company the contract for the 20,000,000-gallon pumping engine for the North Point station declared null and void, on the ground that the eight-hour labor requirement in the second advertisement for bids for the work was illegal. The bill asks that an order be issued restraining the city from paying out any money on the contract, and enjoining the William Tod Company from carrying out any of the terms of the contract. The contract was for $74,000. The Filer & Stowell Company were among the bidders for the work, whose bids were rejected by the council. The plaintiffs claim that they are taxpayers in the city to the amount of $9,000 a year and that this action is brought on the behalf of all taxpayers similarly situated with them, as well as on their own behalf.. They point out in the bill the requirements set forth in the city charter for the advertising for and accepting of bids for public work and state "that the city charter has provided and does provide, that all contracts shall be awarded to the lowest bidder who shall have complied with the requisitions stated in the charter."

Encouragement of Home Cement Industries Asked of New York State Canal Board.

The State Canal Board of New York has received a petition from the Helderberg Cement Company of Albany and six other cement companies, asking that in the construction of the new barge canal the cement manufactured in New York State shall be given preference over cements made in other States; that the cement industry in this State is in its infancy and any protection the State might grant would be in line with its policy in relation to labor on public works and stone used in building good roads.

Charles H. Ramsey, assistant general manager of the Helderberg Cement Company, appeared before the board and stated that $15,000,000 is invested in cement works in New York, and only 6 per cent. of the total output of cement in the United States is produced here. In Pennsylvania 60 per cent. is produced. There is plenty of raw material in New York and the capacity of the mills is 3,500,000 barrels a year. He stated that the favor asked by the companies in the State of New York is not unusual, as there is a law on the statute books providing that stone for good roads must be quarried in the State, the disposition of the State being to favor home industries and labor.

The petition presented by the cement companies and which will be considered by the board, is as follows:

There are several millons of capital invested in the manufacture of Portland cement in this State. This investment yields to the State directly by taxation, a large revenue, while the employment by the various cement companies of thousands of workmen, affords a home market for the farmers and manufacturers within the borders of the State, thus yielding to it a large indirect revenue. In view of these facts, we, the undersigned cement companies, respectfully request that your board take such steps as may be within its power to provide that, in the construction of the new barge canal, the cement made within the State's boundaries shall be given preference over other cements, conditioned only that the quality and price shall be equal to the cements made without the State.

"Respectfully yours,

"The Helderberg Cement Co., T. Henry Dumary, president; Alsen's Portland Cement Co., Herman Baasch, treasurer; Glens Falls Portland Cement Co., W W. Maclay, president; Empire Portland Cement Co., Charles A. Lockard, manager; Wayland Portland Cement Co., V. F. Whitmore, president; Cayuga Lake Cement Co., M. E. Calkins, president; Thomas Millen Co., F. W. Millington, secretary.

Fire Test of Concrete-Steel Building Construction.

A fire test of concrete was made July 20 by Professor Wilson of Columbia University, by subjecting a test chamber to a wood fire for four hours, reaching 1700 degrees temperature, and then cooling by means of a stream from a 2½-inch hose under 60 pounds nozzle pressure for 20 minutes, followed after 20 minutes by further water under 30 pounds pressure for about five minutes.

The test chamber had above it a floor designed for and loaded with 150 pounds of pig iron per square foot, with girders,

supporting columns and floor slabs, partition walls and pilasters of designs meeting the requirements of the New York building departments for concrete-steel construction. The fire was built in the room of cordwood on grate bars with proper draft in one corner of the room and chimney in opposite corner.

The deflection of beams during the fire was ¾-inch and after application of water it increased to 2¼ inches and later to a maximum of 3 3-16 inches. The lower side of the beams lost from 4 to 5 feet of concrete deep enough to expose part of the outer group of steel reinforcing rods. A column lost one corner for about two feet of its length, exposing a rod, and warped 1½ inches out of plumb. The partition walls showed no cracking or peeling. One floor slab showed one crack. These losses were all apparently due to the stream of water and not to the direct action of the fire. A half-inch of wall plaster on the surface of the concrete had practically all disintegrated. The outside of the wall was at no time too hot for the hand.

Mr. Charles W. Weller of the Engineering Company of America, who observed the tests and from whose notes in "The Cement Age" the above information was taken, considers that the test was entirely satisfactory and demonstrates the adaptability of concrete-steel to building construction under the most severe conditions.

Chicago Improvement and Business Conditions.

By Charles B. Maugham, Chicago, Ill.

The Illinois Supreme Court has just decided that when local boards of public improvement neglect the interests of taxpayers, the members of such boards may be held personally accountable for damages sustained by the taxpayers. The decision was rendered in the case of Antoinette Gage against the members of the board of improvements of the town of Wilmette, Ill., and William McGrew, a contractor. The plaintiff charged that the Board of Improvements conspired with McGrew, the contractor, to injure the owners of property assessed for $25,127.29 by constructing pavement in a manner differing from that provided by an ordinance. The plaintiff further charged that the cost of the work was only 30 per cent. of the amount charged. She lost in the lower court and in the Appellate tribunal, but the Supreme Court upheld her cause, in which she seeks to recover damages in the sum of $5,000. The court in its decision ruled that the failure of a public official to perform a public duty can constitute an individual wrong only when some person can show that in the public duty was involved also a duty to himself as an individual, and that he has suffered a special and peculiar injury by reason of its nonperformance. The court declared that where a duty to improve or repair a street is an imperative one and is one in which an individual has a peculiar private interest as distinguished from that he has in common with other members of the community, the officer who negligently performs or corruptly refuses to perform the duty so enjoined upon him must make good to the individual any special loss or damage that he may have sustained.

The city public improvement officials and a number of public utility corporations are planning to construct a large tunnel to carry the pipes, wires and conduits of the municipality and the corporations running between the north and south divisions of the city.

Property owners on State-st. have obtained a permit from the city to construct by private contract an asphalt pavement for a distance of three blocks, that portion of the street which is occupied by most of the fine large retail stores. The cost of the paving will be borne by the property owners affected by the improvement, and will be approximately $50,000. Some of the largest business houses in Chicago will be benefited by the improvement. The old pavement was laid about twenty years ago, and has been repaired many times since. The underground work on the conduits, pipes and cables, necessary before the laying of the new pavement has already been started, and is being done at the joint expense of several public utility companies, the city water department and other parties interested. The projectors of the improvement expect to have better work done than if it was let under a city contract and claim the cost will be about one-half what would have to be paid by the city.

The largest contract ever let in Chicago for a single system of sewers to be built by special assessment was awarded a few days ago by the board of public improvements to the M. P. Burns Construction Company at its bid of $957,207. The sewers are to drain a large area in the southern part of the city, and the work involves the construction of fourteen miles of concrete sewer. The sewers will range in size from 2½ to 11 feet in diam-

eter, the longest section being one that is to be a little over a mile in length and varying from 7 to 11 feet. The highest bid on the work was $999,276.

A councilman has discovered a man who has invented a machine which when attached to an automobile will start a shrill whistle going the moment the auto runs faster than an established speed. He proposes an ordinance compelling every automobile owner to purchase one of these machines and attach it to his auto.

The cleaning of the streets in the downtown business district of Chicago by private enterprise with funds subscribed by business men and property owners, under the auspices of the Commercial and Merchants' Clubs and entirely independent of city control or assistance, has proven such a success that the scheme is to be put on a solid financial basis and made a permanent undertaking. The backers of the work, the two clubs mentioned, who put the whole matter in charge of Richard T. Fox, the New York expert who was brought here to supervise the undertaking, are now enlisting the aid of business men in the downtown district in extending it beyond the limited territory in which it has heretofore been conducted. An auxiliary committee will secure substantial contributions from persons to be benefited. Superintendent Fox has submitted plats of each block showing the tenants and the cost of street cleaning per month and year, which varies according to the width of the street, the kind of pavement, its condition and the amount of traffic. From nine to seventeen cents a month is to be the outlay required to clean one foot of frontage. The block system will be continued as the means of keeping the thoroughfares thoroughly clean at all times, a sufficient force of men and carts being kept at work during the day with a finishing removal of dirt and rubbish after the theaters close at night.

The cement market shows little change from last month. Eastern carload lots are selling in the neighborhood of $1.40, while western is quoted around $1.25, with probable shadings on both qualities under some circumstances. There has been no particular improvement in demand. Additional mills are reported closed since last month and the Peninsular plant is also out of service owing to a fire. Mill stocks as a whole are reported considerably reduced during the past month and in consequence some plants are reported to have gone back to full time again in order to renew supplies. Some houses are making comparisons and estimates on the business of the season as a whole and the result is that they find conditions not to have been so poor as their talk would have led one to believe earlier in the season. While the price conditions have, of course, been against the trade, compared with last year's figures, most of the dealers reporting at the present time find that the bulk of their trade has been fully equal and in some cases in excess of the business done up to this period last year. The only line where this is not true is in the natural cement business, which shows a considerable falling off in bulk owing to the fact that Portland cement is largely supplanting the natural product where the latter has been formerly used exclusively.

Appropriations Made for Municipal Improvements.

The street and sewer directors of Wilmington, Del., are trying to evolve some plan for meeting the great demand made upon the department's resources for streets and sewers. The annual appropriation is $100,000, and the fixed expenses approximate $80,000, which leaves only $20,000 for repaving streets, laying new pavements, and the extension of sewers. The city does not pay all of the expenses of the sewers, the abutting property being assessed, but in most instances the payment of sewer assessments is not prompt and the city makes immediate outlay for each sewer, while the reimbursement in many instances is slow. The department has numerous demands upon it for the opening, paving and other improvements of streets, for the extension of sewers, etc., but on account of the limited resouces it has very little money for making the improvement and many of the requests cannot be granted. The last annual report of Street Commissioner Pierson shows that while the city received $120,000 in 1889, its street lighting bill was only $25,507.54. The street lighting bill last year was $41,693.74, and the appropriation was $20,000, less than in 1889. Other items of expense are given for comparison, as follows:

	In 1899.	In 1903.
Street cleaning	$4,200 67	$13,266 20
Repairing streets	5,853 13	10,972 05
Removing ashes	5,037 30	9,927 81
Total fixed expenses....	$40,598 64	$75,859 80

The city was larger in area in 1903 and had 20,000 more people than in 1889, and about $200,000 more tax was collected. The Street Commissioner, in order to ascertain how the streets and sewers are cared for in some of the leading cities of the country, sent to a municipal officer in each city a letter containing the following question:

"What amount of money does your city appropriate annually to the department of highways and sewers, covering the following: Grading, opening, curbing, paving, repairing and cleaning streets, removal of ashes and rubbish, building of new sewers and maintenance of same, and street lighting?"

From the responses received he has obtained the following data:

Albany, N. Y., population, 74,511—Street lighting, $86,492; street department, $94,550.

Atlanta, Ga., 89,872 — Department of streets, $180,000; department of sewers, $65,000; cleaning streets, garbage, etc., $112,000; street lights, $90,000.

Buffalo, N. Y., 352,219—Paving repairs, $70,000; cleaning streets, $130,000; removal of ashes, garbage and destruction, $133,425; repairs of sewers, $2,500; street lights, $173,205; cleaning sewers, $7,000.

Baltimore, Md., 508,957—Appropriations vary.

Boston, Mass., 560,892—No set amount appropriated.

Bridgeport, Conn., 70,996—Appropriation, $135,000.

Cambridge, Mass., 91,886—Sewer maintenance, $18,000; sewer construction, $118,000; street lights, $76,000; department of streets, $255,908.

Camden, N. J., 75,935—$54,000 for grading, opening, curbing, paving, repairing, cleaning streets, removal of ashes and maintenance of sewers; street lights not given; new sewers, property owners assessed 66 per cent.

Cleveland, O., 381,768—Cleaning streets, $150,000; paving, $750,000; sewers, $1,000,000; lighting, $202,500; garbage, $31,500.

Columbus, O., 126,560—Street repairs, $12,000; sewers, $14,000; street lighting, $80,000

Denver, Colo., 133,859—Sprinkling streets, $55,000; cleaning streets, $55,000; lighting, $101,500; sewer flushing, $17,000; street repairs, $58,000; cross walks, $55,000; grading, $10,000; paving, special; sewers, special.

Dayton, O., 85,333—Street lighting, $38,872.33; removal of ashes, $13,642.35; cleaning streets, $20,625.98; street sprinkling, $1,086.08; paving streets, special fund.

Des Moines, Ia., 52,139—Grading and opening streets and alleys, $2,830.18; repair, curbing and paving, $3,000; cleaning streets, $18,000; sewer fund, $35,121.72; street lighting, $48,696.15.

Fall River, Mass., 87,863—Appropriation for 1903, $432,189.40.

Grand Rapids, Mich., 87,565—Cleaning and repairing streets, $47,000; cleaning and repairing sewers, $6,750; maintenance of city lighting plant, $25,000; new lights, $1,500.

Hartford, Conn., 79,850—Appropriation about $325,000.

Indianapolis, Ind., 194,000—Street repairs, $68,500; sewers, $11,500; openings and vacations, $200; cleaning streets, $72,500; street sprinkling, $45,000; street lighting, $135,000; sewers paid by abutting property.

Jersey City, N. J., 206,433—Grading and repairing unpaved streets, $500; repairing paved streets and minor and current repairs, $27,528; cleaning streets, removing ashes and garbage, $67,300; street lighting, $165,300; cleaning sewers and basins, $20,000; new sewers paid by assessments on property benefited.

Kansas City, Mo., 163,752—Street cleaning and repairing sewers, $100,000.

Lawrence, Mass., 62,559—Street department, $55,000; sewer department, $10,000; street lighting, $44,500.

Louisville, Ky., 204,731 — Repairing streets, $62,000; reconstructing streets, $123,000; cleaning streets and gathering garbage, $125,000; electric lighting, $125,000; gasoline lighting, $10,000; sewer construction, $8,000; sewer repairs, $1,200; sewer cleaning, $13,000.

Lowell, Mass., 94,969—Highways, $150,000; new sewers, $75,000 to $100,000; ashes and rubbish, $32,000; street lighting, $100,000; maintenance of sewers, $23,000

Lynn, Mass., 68,513—Street department, $53,884.56; ashes and rubbish, $16,037.79; new sewers, $28,108.80; sewer maintenance, $10,390.70; street lighting, $52,012.41. These amounts were expended last year

Memphis, Tenn., 102,320—Very uncertain, average about $150,000.

Minneapolis, Minn., 202,718 — About $800,000.

New Bedford, Mass., 62,442—Highways and streets, $175,000; maintenance of sewers, $17,000; new sewers, special appropriation; street lighting contracted for with gas company.

Newark, N. J., 246,070—Cleaning and repairing streets and minor expenses, $135,000; cleaning and repairing sewers, $40,000; ashes and garbage, $79,333.30; street lighting, $216,227.59.

Nashville, Tenn., 80,865—Streets, $90,000; lateral sewers, $30,000; sidewalks, $15,000; city reimbursed later; paving special appropriation of $100,000 each year; trunk sewers, special, appropriation, $100,000 each year.

New Haven, Conn., 108,027—Appropriation, $227,034.

New Orleans, La., 237,104—Cleaning streets, $85,000; ashes and garbage, $91,000; street lighting, $108,000; sewers are constructed and maintained by revenue from a special tax.

Paterson, N. J., 105,171—Repairing streets, $11,000; cleaning and repairing sewers, $10,000; cleaning streets, $25,000; ashes and garbage, $30,000; cleaning permanent streets, $12,000; street lighting, $90,000.

Providence, R. I., 175,597—Building and maintaining highways, $280,000; maintenance of sewers, $125,000; street lights, $290,000; construction of sewers, $265,781.

Philadelphia, Pa., 1,293,697—Appropriation of $1,639,660.18. This does not include the cost of gas lighting, which is furnished free by the United Gas Improvement Co., for the damages paid by the city for opening new streets.

Pittsburg, Pa., 321,616—Cleaning and maintaining highways and sewers, $440,000; street lighting, $365,000.

Reading, Pa., 90,000—Grading, $1,000; curbing, $2,500; opening streets, nothing; new paving and sewers, popular loan; repairing and cleaning streets, $45,000; repairing and cleaning sewers, $20,000; lighting, $70,000.

Rochester, N. Y., 162,465—Street cleaning and snow removal, $100,000; asphalt street repairs, $24,000; repairs of other streets, $11,000; sidewalk repairs, $4,500; removal of ashes and rubbish, $82,000; sewer flushing, $6,000; total appropriation for street and sewer bureau, $298,000; new sewers paid by local assessments; lighting, $229,000.

Springfield, Mass., 62,059—Grading, paving, repairing and cleaning streets, $140,000; walks and curbing, $14,000; removal of ashes, $15,000; sewers and drains, $30,000; street lighting, $74,000.

St. Paul, Minn., 163,632—Repairing and cleaning streets, maintenance of sewers and the removal of garbage, $175,000; street lighting, $180,000.

St. Joseph, Mo., 102,979—Streets, sewers, etc., $88,000; street lighting, $33,000.

Scranton, Pa., 102,026—Grading, opening, curbing, paving, repairing and cleaning streets, $54,000; repairing and cleaning sewers, $10,000; street lighting, $55,280.

Syracuse, N. Y., 107,374—Street cleaning, $71,350; street repairs, sewers, bridges, including $7,000 for one new bridge, $51,555; ashes and garbage, $52,311.25; street lighting, $113,000.

St. Louis, Mo., 575,238—Street opening, $15,000; street cleaning, labor and carts, $110,000; street cleaning, block system, $60,000; street cleaning, permanent improved streets, $120,000; street repairing, $220,000; street lighting, $500,000; maintaining sewers, $91,000.

Toledo, O., 131,822—Appropriation, $125,000.

Trenton, N. J., 73,307—Grading, repairing, cleaning streets, $40,000; removal of garbage and ashes, $22,000; new sewers paid for by property-owners; maintenance of sewers, $4,500; street lighting, $62,000.

Troy, N. Y., 60,651—Streets, alleys, highways, sewers, including repairing of same, removal of ashes and garbage, cleaning, sprinkling and care of streets, $138,600; street lighting, $82,900

Washington, D. C., 278,718—Appropriation for 1904, $2,000,000.

Worcester, Mass., 118,421—Streets, $300,000; sewers, $65,000; street lighting, $11,000.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal and State Reports—New Publications.

Municipal and State Reports.

Report of the Water Board of Bangor, Me., for Year Ending March 1, 1904. M. A. Sinclair, Superintendent.

Bangor pumps its water supply, using a daily average of 3,484,327 gallons and a maximum of 5,800,000 gallons. The receipts from water for the year were $66,559 and for the seventh consecutive year all rates were collected before the end of the year. Expenditures were $62,221, including $8,727 for construction and $30,260 for interest. The bonded indebtedness is $500,000 at 6 per cent, which will shortly be refunded at a lower rate of interest. The value of water furnished free to various city departments is $13,304.75 a year, $9,162.50 of this being charged to the fire department, there being 223 hydrants.

Annual Report of the Controller of Detroit, Mich., for Year Ending June 30, 1903. F. A. Blades, Controller.

The reports of Detroit's controller are models of classification and detail which it would be well for every city to follow. While not exactly following the forms adopted by the National Municipal League it should not be difficult to arrange the information in the same form.

Part I contains thirty-four tables classifying the general receipts and disbursements and giving their aggregates. Part II gives the trial balance, the aggregate

receipts, disbursements and balances and the details for each fund, taking sixty-three tables. Part III has six tables giving the public debt and sinking funds, separated into general city, special assessment and water bonds, floating debt, sinking fund and net public debt. Part IV shows the aggregate value of city property and in twelve tables the detail for each department. Part V gives comparisons with other years in public debt, assessed valuation, tax levy and rate, length and cost of pavements, and sewers and miscellaneous receipts. Part VI real estate owned by the city with cost and estimates of present value of land and of improvements, and a statement of city property leased. Part VII gives estimates for 1903, the appropriations based on them, giving each item in detail, also the assessed valuation, tax levy and rate of taxation required to raise the money appropriated.

An interesting fact regarding the city's sinking fund is that it owns all the special assessment bonds which have been issued to pay for street improvements, also water bonds, public sewer, lighting, park, boulevard, building and improvement bonds of the city and county, amounting in all to about $1,500,000 of the total sinking fund of $2,106,669.

All the funds of all city departments, whether within the debt limit provisions of the charter or not are accounted for so that it is not necessary, as is so often the case, to search through a number of department reports to find the details of all the city's receipts and expenditures.

Annual Report of Water Works of Newport, Ky., 1903, W. L. Glazier, Supt.

This plant seems to be in good financial condition, having receipts of $54,861.44 and disbursements for maintenance and operation, including taxes and pipe extensions, of $24,150.40, permitting the transfer of $30,000 to the sinking fund. This sum is nearly $6,000 more than the interest on the bonded debt of $636,000, so that the latter will be slightly decreased.

The department has had trouble with flush tanks on the sewer system, the reported flow through them in 1899 being 700,000 gallons a day. They were regulated with pet-cocks, reducing the flow to 150,000 gallons a day. During the past year stop cocks were put outside the tanks with discs inside of special fittings, reducing the openings to about 1-16 inch. The seventy-seven tanks now in use are set to discharge once in ten hours and are now estimated to use 37,000 gallons a day. At 2.3 cents a thousand gallons this last saving amounts to about $1,000 a year. The improvement cost $980.

Approximately 45 per cent of the water pumped is metered, nearly 20 per cent of the unmetered water being used for public purposes. Over one-third the revenue is from metered services. From the estimate of water used through unmetered services, it is concluded that the revenue from unmetered water is 8.87 cents per 1,000 gallons, and for metered water it is 10.7 cents, although three-fourths of the metered water is used by manufacturers at a rate of 7 cents. The schools and public buildings will be metered that the uses of water may be definitely located.

Annual Reports of the Water, Gas and Electric Light Departments of Danville, Va., 1903. Frank Talbott, Supt and Treas.

These departments are all operated by the same superintendent, who has also been city engineer. Capt. C. A. Ballou held the office for twenty-seven years and on account of his death Mr. Talbott, who has for some years been the assistant superintendent, secretary and treasurer prepared this report. The three kinds of business are kept entirely distinct and show clearly their respective standing.

Danville is one of a very small number of cities which own their gas plants and the report of this department is therefore of special interest. The total receipts of the gas department were $36,307.86, and of this sum $31,187.66 received and yet due on bills rendered is from the sale of 32,383,900 cubic feet of gas, after leakage and condensation are allowed for. The cost of making this gas was $30,300.16, running expenses, or 90 cents per 1,000 feet of gas distributed. The receipts as given above do not include gas used for public purposes. If this amount, $1,592.30, is added to the excess of receipts over expenditures, the actual profit of operation is $7,600. This pays 4 per cent. depreciation on the valuation of the works, $100,968, and leaves 3½ per cent interest on the investment. These figures are not based on the actual cash received, but include all assets and liabilities in the way of bills receivable and payable.

The superintendent approves the methods of keeping accounts which have been adopted, making each department show its actual condition. He says:

"Ever since the city purchased the property these departments have been made to pay running expense only.

'Construction,' 'depreciation,' 'lost taxes,' and even interest on the investment have been charged to the 'general fund.' We have been fooling ourselves, and are the poorer thereby. The plan adopted, and under which we are now working, is that upon the new valuation these properties are to pay 4 per cent. interest, and are to take care of their own construction by paying a like rate of interest for such amounts as they may require from the city. It further provides that at the end of the year, on recommendation of the Committee, depreciation is to be charged against the property value. This is good as far as it goes. I hope the Council may see the wisdom of requiring each department to lay aside each year an amount equal to the property depreciation. I would also like to see the departments pay into the 'general fund' an amount equal to what the city would receive as taxes if the property were not owned by the city. This policy is based on the idea that these valuable franchises belong to the whole people, irrespective of whether or not they be consumers."

He recommends some improvements in manufacture of gas and some extensive extensions of gas mains into new territory. The system now has 11.8 miles and 967 meters in use.

Annual Reports of the Fort Wayne, Ind., City Government, 1902-03, Henry C. Berghoff, Mayor; F. M. Randall, City Engineer.

These reports occupy 392 and 428 pages respectively, because the printer has been permitted to pad it with full-page sub-heads and blank pages as well is excessive spreading of matter until it has become inconvenient to find any individual report. The classification and detail of expenditures and receipts so favorably commented on in the Detroit report is not found in these volumes and it is very difficult to find the accounts of funds and in some cases to determine their status.

The city owns its garbage crematory and collects a large share of the garbage and refuse, the number of tons hauled by city wagons being 4,804 and by others 2,768. The crematory incinerated 7,290 tons of garbage and refuse, averaging 25.58 tons each working day at a cost for fuel, part coal and part natural gas, of 32 1-3 cents per ton. The total expenditures for collection and cremation of garbage were $9,198.86.

The city has a growing fund from a special tax with which to build an electric light plant. It amounted to $43,000 in 1902 and to $62,000 in 1903. The bonded indebtedness was reduced $5,000 each year to $614,800.

During 1903 21,989 linear feet, 90,473 square yards of brick and asphalt pavements were laid at a total cost of $192,-056, of which 2.75 miles were asphalt and 1.4 miles were brick. Brick sidewalks cost $5,900, pipe sewers, $27,859 for 24,026 feet. The cost of engineering for these improvements does not seem to be given.

The municipal water plant reports total receipts of $80,288 in 1903, of which sum $10,000 was from the city. Expenditures were $25,173 for construction, $31,072 for ordinary maintenance, $6,235 for salaries, etc., making a total of $62,480. The payments for interest and sinking fund are not given, nor is there any explanation of the receipts of $10,000 from the city, when the total receipts, exclusive of this were materially greater than the total expenditures reported.

New Publications.

The Purification of Sewage and Water, by W. J. Dibdin, F. I. C., F. C. S. Third edition, revised and enlarged. 379 pp., cloth, $6.50. D. Van Nostrand Company, New York City.

Mr. Dibdin was the chemist in charge of experiments on the purification of London sewage, upon the basis of the results of which great sewage purification plants are now under construction. He first asserted the necessity of bacterial action in the purification of sewage in a paper read before the Institute of Civil Engineers in 1887, before the Massachusetts experiments on the purification of water and sewage were begun. His first report on the experiments on the bacterial treatment of London sewage was published in 1892 and the first edition of this book was published in 1896. The author is therefore well qualified to speak with authority on the treatment of large quantities of sewage. He has also had charge of other works of less magnitude and this new edition gives the ripe results of his experience in many lines of sanitary work connected with the general subject of the volume.

The first seven chapters give a sketch of the history of purification methods sufficient to show the ground that had been cleared for the modern methods. Antiseptic and bacterial methods, including precipitation, septic tank bacteria beds and land treatment and the early London, Sutton and Massachusetts exper-

iments are briefly considered in the 116 pages devoted to these chapters. The experiments at Manchester and Leeds leading to bacterial beds, septic tanks, stormwater areas, irrigation areas, etc., for Manchester, and to some chemical treatment bacteria beds, and tanks, and considering the effects of the various trades wastes, in Leeds, are fully described and the reasons for the methods adopted are clearly set forth.

There are very valuable chapters on the bacterial treatment of various kinds of factory refuse and such important and poorly understood problems as automatic screening of sewage, the action of soft water upon lead, the absorption of atmospheric oxygen by water, the ventilation and deodorization of sewers.

An interesting history of the progress of the purification of the Thames is given. The evil effects of the discharge of unpurified sewage into sea water are clearly set forth.

The character of the London water supply is shown by comparison with confessedly pure sources and the systematic examination of potable waters is described. A microscopical examination for matters in suspension according to a method described in an appendix is particularly recommended, but it is recommended that this be supplemented by chemical and bacteriological analysis, for simple methods of which instructions are given. The interpretation of analyses is carefully considered in one chapter. The valuable conclusions of the royal commission on sewage disposal are given in the last chapter and methods of determining dissolved oxygen in water are given in the last appendix.

The author shows his perfect familiarity with all branches of his subject and has added perhaps as much as any other one man to our knowledge of it. The book is authoritative and practical in the best sense, and gives some very valuable indications of methods of attacking any problem of sewage or water purification.

ORGANIZATIONS AND INDIVIDUALS

Municipal Societies at St. Louis—Alliance of Civic Organizations—Syracuse Technology Club—Technical Meetings—Civil Service Examinations—British Engineers—Personal Notes.

Conventions of Municipal Improvement Societies at St. Louis.

The eighth annual convention of the League of American Municipalities will be held in East St. Louis and St. Louis Oct. 4, 5 and 6. The subjects to be covered by the program are municipal charters, garbage disposal, street lighting, sewage disposal, filtration of water, street paving the Ford franchise tax law, what utilities should a municipality own, what improvements should a city do by contract, how to equalize taxation, special assessments, a glimpse at the history of municipal progress.

On Oct. 6, "Municipal Day," at the Louisiana Exposition, a joint meeting of various civic organizations is planned, to be held on the Exposition grounds. The following papers regarding the aims and accomplished work of these organizations are promised: Of the National Municipal League, by Clinton Rogers Woodruff, secretary; of the League of American Municipalities, by John M. Head, ex-president; of the American Society of Municipal Improvements, by Charles Carroll Brown, second vice-president; and of the American Civic Association, by J. Horace McFarland, president, with the subject, "The Civic Problem Discussed from an Improvement Point of View." Mrs. Conde Hamlin gives an explanation of the municipal itinerary of the Exposition.

It is proposed to devote at least a part of one session of the joint meetings to the discussion of the civic problem from various points of view: From the administrative point of view by Prof. John A. Fairlie, University of Michigan; the religious by the Rev. I. C. Hodgins, Milwaukee; the civil service by Charles Noble Gregory, Iowa State University; the sociological by Prof. I. W. Howerth, University of Chicago; the political by Prof. S. C. Sparling, University of Wisconsin; the legal by Amasa M. Eaton, Providence, R. I., and a report of the Eastern Educational conference by Mrs. W. E. D Scott, Princeton, N. J.

The meetings of the American Society of Municipal Improvements will be held at the Grand View Fraternal Hotel, outside the Exposition grounds in St. Louis, October 4, 5 and 6. As this number of Municipal Engineering goes to press word is received from President Ballard that the following persons have been placed on the program for discussions of the subjects given with their names: G. A. Parker, on "Parks"; Ernest Adam, on "Pollution of the Passaic River"; E. S. Rankin, on "The Use of Sulphur for Sewerpipe Joints"; C. D. Pollock, on "Street Paving"; N. I. Ker, on "Sewage Sanitation"; A. P. Folwell, on "Losses in Underground Structures"; T. C. Hatton, on "Waterworks and Water Supply"; J. N. McClintock, on "Sewage Disposal"; C. H. Rust, on "Taxation"; G. H. Benzenberg with report of the committee on review; E. A. Fisher with report of committee on electric street lighting, and C. H. Rust with report of the committee on taxation and assessment.

The meeting of the societies at so near the same time and place and the proposed joint meetings on one day should make this year's conventions of these societies more than usually attractive. In them all the officials of all municipalities will find themselves welcome and in one or another can select what will be of most value to them. Two of them are almost entirely composed of municipal officials, one of the legislative class and the other of the administrative class. Cities should hold memberships in both societies, and meeting held at the same times and places make it possible for the cities to be represented in both by their officials in both departments and thus to secure all the benefits of both. Undoubtedly many would avail themselves of such opportunities to attend such sessions of both conventions as appeal most to them.

The Alliance of Civic Organizations.

The Alliance of Civic Organizations has been formed in accordance with the ideas of those who have been discussing for a year or two methods of bringing about such unity of action as may be possible among the various societies devoted to the study of civic problems. The constitution of the Alliance provides that it shall be composed of associations having for an object the improvement of political, educational, artistic, sanitary, material or moral conditions in American cities. Its purpose shall be to facilitate an exchange, accumulation and distribution of pertinent information, to promote a more complete understanding and cooperation among its members, and to assist them in increasing their influence and efficiency, and avoiding any unnecessary duplication or overlapping of their respective lines of work. It shall be controlled and directed by trustees elected or appointed by the associations of a general or national character belonging thereto, each of such associations to elect or appoint three trustees. The trustees appoint a secretary and other officers, raise funds and incur expenses, admit organizations to membership, provide for publications, etc. It is expressly provided that the trustees shall not attempt interference with the action or management of any of the component societies and that their acts shall not be binding on any society unless expressly authorized or approved by it.

Technology Club of Syracuse, N. Y.

The Technology Club of Syracuse has organized at Syracuse, N. Y., with a charter membership of 129, including engineers, architects, analytical chemists, metallurgists and geologists. The headquarters of the club are at No. 707 Dillaye Building, where rooms have been suitably furnished for library and social purposes. Meetings are held monthly, except during the months of June, July, August and September. The officers were elected at the organization meeting. Prof. John E. Sweet, president; Dean William Kent, first vice-president; Henry C. Allen, second vice-president; Edward N. Trump, John H. Barr, Edmund L. French, James A. Randall, directors; Alexander T. Brown, treasurer; A. Frederic Witmer, secretary.

The club has taken a trip over the Auburn & Syracuse Electric Railway to Auburn, N. Y., where several large man-

ufacturing plants, and the power house of the above mentioned railway were visited. These visits to manufacturing plants are to be made one of the special features of entertainment and instruction.

Technical Meetings.

The annual meeting of the society for the Promotion of Engineering Education will be held at St. Louis, Mo., September 1, 2 and 3. C. A. Waldo, secy., Lafayette, Ind.

The convention of the International Electrical Congress will be held at St. Louis, Mo., September 12 to 16. A. E. Kennelly, secy., Harvard University, Cambridge, Mass.

The annual meeting of the American Gas Light Association will be held at Washington, D. C., October 19, 20 and 21. A. E. Forstall, secy., 58 William-st., New York City.

The annual convention of the New England Water Works Association will be held at Holyoke, Mass., September 7, 8 and 9. Willard Kent, secy., Narragansett Pier, R. I.

The International Engineering Congress will be held in St. Louis, Mo., October 3 to 8, under the auspices of the American Society of Civil Engineers. In response to an invitation from the committee in charge 108 specialists have agreed to contribute papers to form a presentation of the various subjects selected for discussion, each of these papers to be a review of progress during the past decade, in the special line of engineering work under consideration, from the standpoint of practice in the country of the writer. These papers will embrace all subjects, including harbors, natural waterways, artificial waterways, improved waterways, dredges, wharves and piers, water supplies and purification, sewage disposal, garbage disposal, railroads, manufacture of steel, cement, concrete and concrete-steel, tests of materials for construction, turbines and water wheels, pumping machinery, locomotives, electricity, military and naval affairs, and other miscellaneous subjects. Charles Hermany is president and Charles Warren Hunt secretary of the congress.

The eighth annual convention of the Central States Water Works Association was held at Toledo, Ohio, Aug. 16, 17 and 18. Some of the papers submitted were as follows: "The Growth and Prevention of Algae in Reservoirs," George D. Moore, Washington, D. C.; "The Water Meter," C. W. Wiles, Delaware, O.; A. J. Pray, representing the Pittsburg Meter Company, delivered an address from the standpoint of the supply men. Officers were elected as follows: President, W. W. Ferguson, Springfield, O.; first vice-president, A. W. Inman, Massillon, O.; State vice-presidents, John Langan, Tipton, Ind.; W. H. Glore, Covington, Ky.; T. H. Morton, Nashville, Tenn.; A. L. Holmes, Grand Rapids, Mich.; M. E. McKinney, Wheeling, W. Va.; secretary, William Allen Veach, Newark, O.; treasurer, C. E. Rowe, Dayton, O. The next convention will be held at Columbus, O.

The Ohio Association of Boards of Public Service, which met with the Central States Water Works Association at Toledo, O., Aug. 16, 17 and 18, elected officers as follows: President, H. O. Pond, Columbus; vice-president, Charles Crone, Hamilton; secretary, Charles H. Frank, Columbus; treasurer, H. M. Andrews, Elyria.

The tenth annual convention of the Ohio Electric Light Association was held at Sandusky, O., Aug. 16, 17 and 18. Some of the papers presented are as follows: "A Day Load as a Factor in Central Station Earning Capacity," L. D. Holt, St. Louis, Mo.; "Notes on the Incandescent Lamp," E. H. Houghton, Chicago, Ill.; "Transformer Testing for Central Stations," S. E. Johanneson, Pittsburg, Pa.; "Relation of the Supply House to the Central Station," P. R. Boole, Chicago. Officers were elected as follows: President, M. E. Turner, Cleveland; vice-president, F. E. Valentine, Piqua; secretary and treasurer, D. L. Gaskille, Greenville. Executive committee, J. H. Perkins, Youngstown; C. M. Hart, Sandusky; J. F. Bendura, Lima; M. C. Hill, Columbus; W. E. Miller, Mt. Gilead. Advisory committee, D. I. Gaskille, Greenville; Samuel Scovill, Cleveland, E. J. Betchel, Toledo. Finance committee, C. E. Inmann, Warren; N. Way, Lisbon; W. P. Engel, Defiance.

The Southeastern Kansas Good Roads Association held a meeting at Iola, Kas., July 19.

A good roads convention was held at Zebulon, Ga., July 21.

At a meeting of automobilists, horsemen and bicyclists held at Port Jervis, N. Y., July 25, it was decided to organize for the purpose of securing the improvement of streets and highways.

The Lyon County farmers held a meeting at Emporia, Kas., July 16 for the purpose of discussing road improvement and the Lyon County Good Roads Association was formed with officers as follows: President, John E. Hinshaw; vice-president, Eli Fowler; secretary and treasurer, W. S. Williamson.

The San Diego Automobile Club held a meeting at San Diego, Cal., July 6 to discuss the matter of good roads. It was decided to make an effort to secure legislation for the improvement of the roads.

The East Baton Rouge Good Roads Association was organized July 12 at Baton Rouge, La., with C. F. Ratcliff as president and J. C. Barrow as secretary and treasurer.

The Northeast Arkansas good roads convention held a meeting at Anneville, Ark., July 14.

The International Congress of Arts and Sciences will be held in St. Louis Sept. 19-25. A list of over 300 speakers and subjects has been issued, which are grouped in sections under departments in seven great divisions, viz.: Normative, historical, physical, mental and utilitarian sciences, social regulation and social culture. Howard J. Rogers, Director of Congresses, Louisiana Purchase Exposition, will give all desired information and send the latest revised programs.

The Michigan Association of Electric Light Managers was lately formed in Detroit. E. E. Phillips, assistant manager of the Edison Illuminating Company of that city, was elected president, and F. S. Hubbell of Milford secretary.

U. S. Civil Service Examinations.

An examination for engineer draftsmen in the Supervising Architect's office will be held at the usual places on Sept. 14, 15, 16; salary, $1,200 a year.

The Philippine Commission has asked for a half-dozen young civil engineers at salaries ranging from $1,200 to $1,400 at the beginning, and ten foresters whose salaries will range from $1,400 to $1,800 from the beginning. Speedy promotion is promised to suitable men. Applications will be received by the United States Civil Service Commission at Washington, D. C.

Visit of British Engineers.

A party of members of the Institution of Civil Engineers of Great Britain is expected to arrive for a visit to this country early in September and the American Society of Civil Engineers has arranged a program for them which includes a reception at the Society House in New York City on September 13, excursions about New York on the 14th, to West Point on the 15th, to works of interest to engineers in the vicinity of New York, and a banquet on the 16th. The visitors will then visit Montreal as the guests of the Canadian Society of Civil Engineers and will spend one or two days in Chicago on their way to St. Louis, where they will arrive in time for the Engineering Congress.

Personal Notes.

Robert Budd has been elected city engineer at Petersburg, Va.

Frank Watson has resigned his position as city engineer at Marshall, Mo.

James Wright of Frankfort has been appointed City Engineer of Anderson, Ind.

Paul Habercorn has been appointed assistant city engineer at Montgomery, Ala.

Judge Emmet L. Beach of Saginaw, Mich., has been elected Mayor of Point Lookout, Mich.

Charles W. Powers has been elected superintendent of the water department at Bloomfield, N. J.

P. F. Fernandez has been appointed superintendent of public works and L. J. Proctor assistant at Porto Rico.

A. L. Dabney has been elected manager of the water-works, sewerage and electric light plants at Greenwood, Miss.

John B. Wilson has been appointed city engineer at Walla Walla, Wash., succeeding Edwin S. Clark, resigned.

A. L. Pond has been reappointed superintendent of the water-works and electric light plant at Coldwater, Mich.

Adolph C. Goller has been appointed superintendent of the Egg Harbor Water Company's plant at Egg Harbor, N. J.

George Fletcher of Fairmount, Ind., has been appointed city engineer and superintendent of water-works at Brazil, Ind.

B. B. Smith has been appointed consulting engineer of the proposed extensions to the water-works at Montgomery, Ala.

J. C. Miller has been appointed superintendent of water-works at Huntington, Ind., to succeed Robert Berry, resigned.

W. H. Fopping, president of the Columbus Water Works Company, Columbus, Ga., died July 31, aged eighty-four years.

Hon. George W. Rockfellow, former Mayor of Plainfield, N. J., died Aug. 14 at his home in Cardinal, Va., aged sixty years.

Prof. F. G. Frink, Assoc. M. Am. Soc. C. E., has been appointed assistant professor of civil engineering in the University of Illinois.

Frank Cullen, a member of the firm of Cullen Bros., cement contractors at

Peoria, Ill., died Aug. 14, aged thirty-seven years.

Volney W. Foster, former president of the old Western Paving and Supply Company, died at Chicago Aug. 16 of apoplexy, aged fifty-six years.

George H. Felix, president of the water commissioners at Reading, Pa., has been elected general manager of the water department, a newly created office.

F. H. Shaw has been appointed engineer of the special sewer commission at Lancaster, Pa., and will have charge of the construction of a system of intercepting sewers.

Charles W. Dill has tendered his resignation as assistant city engineer at Toronto, Ont., to become manager of the Constructing and Paving Company of that city.

Daniel W. Mead, M. Am. Soc. C. E., Chicago, Ill., has been appointed to the professorship of the newly created department of hydraulic and sanitary engineering at the University of Wisconsin.

Roscoe Cornell, formerly with the Mine and Smelter Supply Company of Denver, has been appointed manager of the branch office which the Allis-Chalmers Company has recently opened up in El Paso, Tex.

Dickerson G. Blaker of Willimantic, Conn., and Samuel M. Greene of Holyoke, Mass., have formed a partnership and established offices in Holyoke and New York City, and will practice as consulting engineers.

Hon. James M. Sullivan has been elected Mayor at Anderson, S. C. Aldermen were elected as follows: W. L. Brissey, Dr. W. H. Nardin, jr.; O. B. Van Wyck, C. W. Webb, Lee G. Hollmon and R. E. Ligon.

Geoffrey Stengel, former superintendent of the Monongahela Water Company of Pittsburg, Pa., died in that city Aug. 6. Mr. Stengel was with the Monongahela Water Company as engineer and superintendent for twenty-seven years. He retired in 1891.

James V. Gorman, city civil engineer at Warsaw, Ind., was overcome by foul gas recently while trying to rescue William H. Funk, city marshal, and both men were lifeless when removed from the sewer. They were inspecting the machinery in the lift well connected with the sewer system.

Hon. J. W. Romaine has been installed as Mayor of Bellingham, Wash. Other city officers are as follows: Councilmen—S. B. Van Zendt, George B. Blakeslee, George Butler, S. E. Mullin, E. M. Adams, E. J. Cleary and C. F. Nolte; water superintendent, Albert C. Lark; city engineer, George M. Gerard; superintendent streets and sewers, D. L. Hopkins; fire chief, Andrew J. Land.

J. W. Howard, C. E., who makes a specialty of asphalt and asphalt pavements, recently made a tour of central and western cities investigating the different kinds of asphalt pavements, their qualities, cost of repairs, etc., especially in view of the recent adoption in New York of the requirement that asphaltum for pavements shall be at least 90 per cent. pure. He also investigated the fluxes and other materials used.

MACHINERY AND TRADE

Dodge Transmission Machinery.

An interesting and comprehensive display of power transmission appliances at the world's greatest exposition is made at Block 31, Machinery Hall, in the space allotted to the Dodge Manufacturing Co., a picture of which is shown in the accompanying cut.

Entrance to the space is flanked by conical stacks of the new Dodge standard iron split-pulley and of the old familiar Independence wood split pulley. Behind the pulley stacks is an arch formed of one-half of a hard maple lagging, such as is made as a prominent specialty for alteration of large wheels at small cost. A lagging of this sort may simply increase the diameter of a wheel, so as to give higher belt speed, or may be made also to increase the face width or to enable change from belt to rope drive. The half wood rim here represent the upper portion of a grooved engine wheel, and from it lead the ropes of the slack side of a Dodge patent American system rope transmission, the ropes passing to an iron receiving sheave at the right-hand side of the space. In proper working position between "driver and driven" is placed the winder and tension equipment.

The iron "driven" sheave is mounted

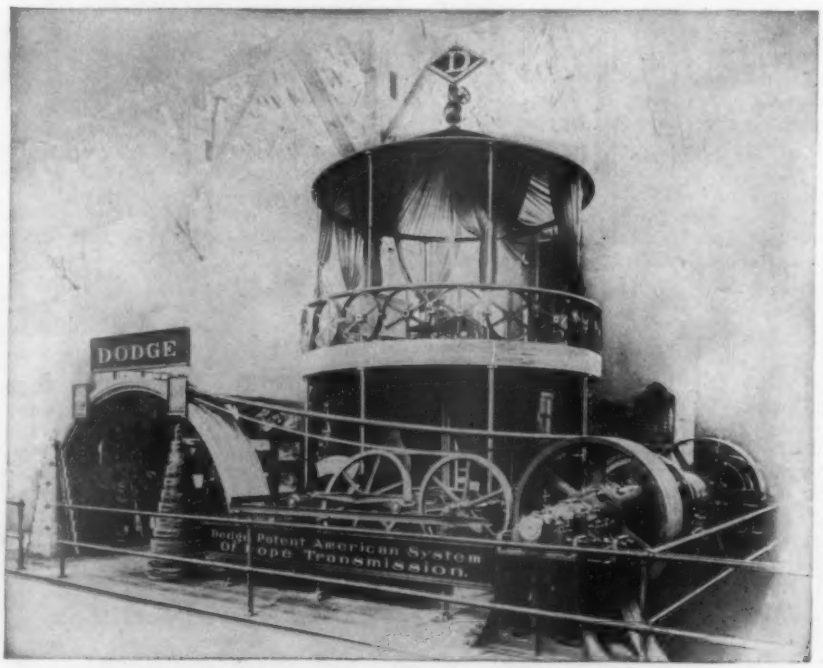
upon the central boss of a quill carried by independent bearings and arranged for clutch connection to the jackshaft passing through its center and extending full depth of the exhibit space. Adjacent to the jackshaft and driven with it are two countershafts. One of these is supported by drop hangers, fitted with different styles of self-oiling boxes, with caps partly in section to permit the visitor to observe the action of the oiling devices. The other counter shows off to advantage the Dodge-Phillips automatic self-adjusting clutch.

At the opposite or left-hand side of the exhibit is a line of special box pattern floor stands with yoke-supported ball-and-socket bearings, collar oiling. Next in the rear is placed a rack holding short shafts fitted with various sizes of the Orton solid clutch for lighter powers and duplex operation. Beyond is an easel carrying sample types and patterns of pulleys, all wood, all iron, and iron center wood rim, each in both solid and split.

Centrally placed behind the rope transmission is the iron center wood rim pulley which was tested at the factory some months ago at a rotative speed corresponding to 28,889 ft. per minute linear rim speed.

An attractive feature of the exhibit is the central pavilion. The upper floor is laid upon one side of a 14-ft. iron center wood rim pulley. A vertical shaft carries the hub, and shafting columns are placed as further support around the rim.

Mr. W. B. Hosford, vice-president of the Dodge company, is in charge, fully competent to do justice to the inquiries of interested visitors.



THE DODGE MANUFACTURING CO. EXHIBIT AT ST. LOUIS.

A Six Cylinder Automobile.

The E. R. Thomas Motor Co., of Buffalo, N. Y., is building six-cylinder racing and touring cars from fifty to one hundred horse power. The first chassis equipped for racing will be ready in October. The bodies enclosed or open will be built to order and a beautiful side door entrance body will be furnished by the manufacturer. Owing to freedom from vibration and constant torque it is believed that the six-cylinder car of the same horse power and weight will prove much faster than any four cylinder car. They are becoming quite popular in England, several of the very best manufacturers are now turning them out as regular models.

The Thomas people will construct a

limited number for parties of known ability and reputation who appreciate that in the double-triple type the Thomas people will have a car of the most flexible control, one of the fastest and most successful in the world. The cars will be built as racers, semi-racers and touring cars, with open or limousine bodies as desired.

Concrete Building Block Architecture.

In line with the call for assistance in developing correct architectural uses of hollow concrete building blocks are the colored charts which have been made by H. S. Palmer and are now ready for distribution. They show in detail how to design buildings and blocks to produce the best results. By elevations, plans, sections and perspective drawings they show how the blocks can be made of size, shape and face for the work required of them, how to fit them together, how to put in the trimmings, door and window frames, joists, etc. A miniature of the H. S. Palmer machine is also shown with guides for making the various forms and sizes of blocks required.

The charts will be of value to any one in the cement block business, though specially designed for use with the H. S. Palmer machine.

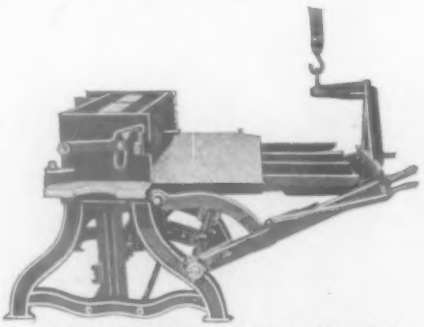
The H. S. Palmer Company is making a large exhibit at the St. Louis Exposition. A building containing block machines has just been completed near the Liberal Arts building and the electric tower. A building has been started in Machinery Gulch, near the Cement Association's building and a working model is in the Mining building.

The Normandin Concrete Block Machine.

The Cement Machinery Company of Jackson, Mich., makes the Normandin machine for making hollow concrete building blocks in what it claims to be the only factory making block machines exclusively. The demand for the machine is such that the factory has been running for some time night and day. The Normandin machine was one of the earliest in the field, and this fact, together with the advantages which the machine offers in making blocks of various sizes and designs and in handling the materials and product, is responsible for the success met by the progressive business management of the company in introducing the machine.

One of the accompanying illustrations shows an interior view of the Lancaster Concrete Block Company's plant at Lancaster, O., and gives some idea of the possibilities of arrangement and operation of machines for rapid and effective work. The concrete mixer is shown in the background, two Normandin machines immediately in front of it and trucks, one full and one empty, for carrying away the finished blocks, are seen on either side in the foreground. A small cut gives a drawing of the machine, showing the mold closed ready for receiving the concrete, the table, the triple hook lifter for carrying away blocks, and the lever for operating the cores.

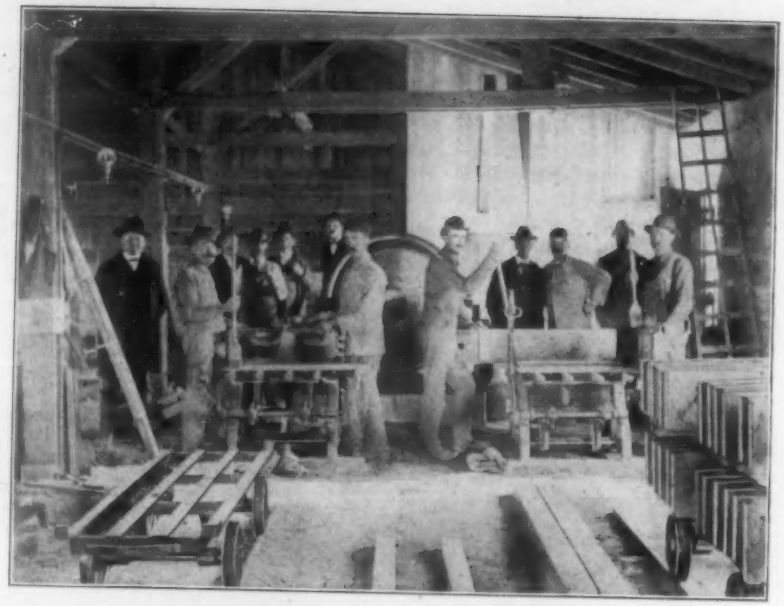
A collection of the attachments whereby the many forms, sizes and designs possible on this machine are provided for, shows nearly 150 pieces. These accompany the machine and cause it to be advertised as "ten machines in one."



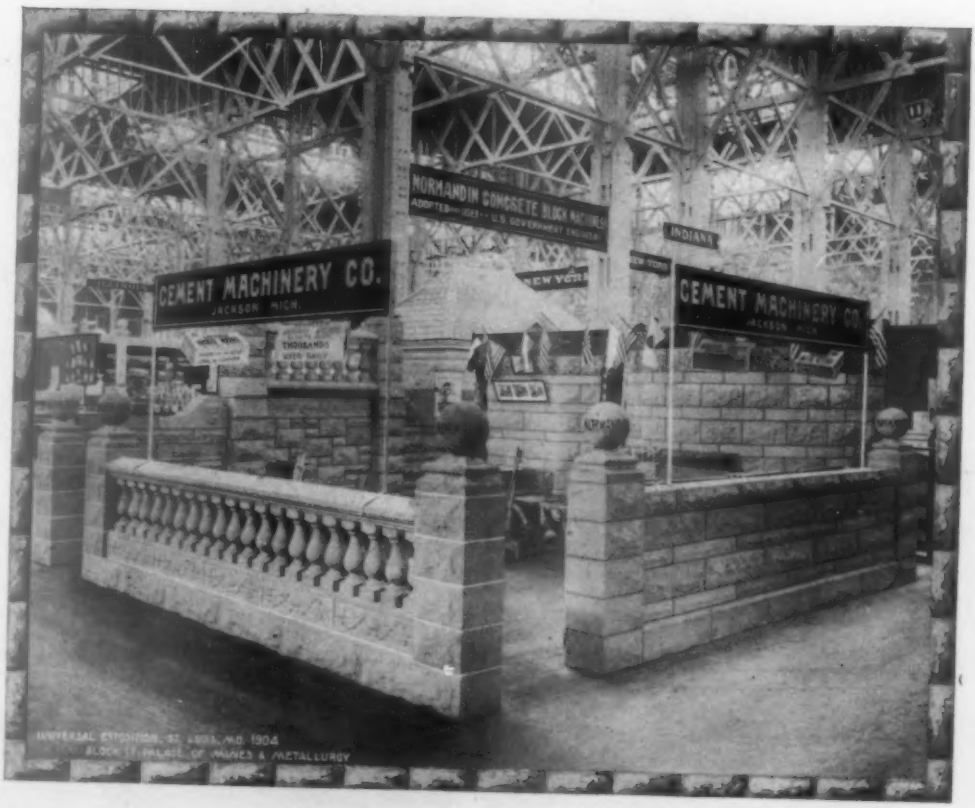
THE NORMANDIN BLOCK MACHINE.

A frequent question from those to whom the use of concrete blocks is suggested is the strength of the blocks. The Normandin block and the materials of which it is made have been subjected to tests by several authorities. Among the results obtained are the following::

A piece 3x4x9 inches was cut out of a broken block, set on end and loaded. It gave way under a load of 7,250 pounds, or 604 pounds per square inch. Another 3.75x3.5x9 was put on end and failed under 15,000 pounds load, or 1,060 pounds per square inch. Tests at the United States Watertown Arsenal on blocks showed the following: A block 6.15x17.35 inches and 9.07 inches deep laid on its bed had an ultimate strength of 332,000 pounds. Taking out the hollows, the actual area of block was 88.63 square inches, showing 3,750 pounds per square inch as the crushing strength of the block in use. Another block 10.18x16.144x9.10 inches and area of concrete cross section of 124.48 square



THE LANCASTER, OHIO. NORMANDIN BLOCK FACTORY.



THE NORMANDIN BLOCK AT THE FAIR.

inches crushed under 4,050 pounds, and some pieces of blocks, each of about 40 square inches cross section and 8.96 inches hight crushed under 3,430 to 3,860 pounds per square inch. A small cube 3x2.56x2.96 inches crushed under 6,070 pounds per square inch. These blocks and pieces were from 120 to 180 days old.

The photograph of the exhibit of the Cement Machinery Company at the St. Louis Exposition shows many of the varieties of blocks that are made on the machine. One of the smaller accompanying cuts shows a house built of the blocks. A close examination of the cut will show the adaptability of the blocks to building requirements.

The company now has machines in about 140 towns in twenty States and Canada and is rapidly extending its field. The catalogue which it issues gives much valuable information on the cement block business and can be obtained by addressing the Cement Machinery Company, Jackson, Mich.

A HOUSE OF NORMANDIN BLOCKS.

A New Macadam Road Roller.

A new duplex macadam road roller has been designed by the Iroquois Iron Works of Buffalo, N. Y., and is now on the market. The design is based on the English practice of locomotive boiler with horizontal engine mounted above it, which has been so long in successful operation, but the details are new and adapted to American conditions.

The rolls are cast of charcoal iron in a chill. The face of the driving roll is beveled, preserving the contour of the road, avoiding ridging and insuring smooth finish. Hardened spikes are inserted for disintegrating old roads. Either or both rolls are made fast to the driving axle by locking pins.

The boiler is 150-lb. working pressure, allowing a safety factor of 5. There are two large capacity water tanks; one under the boiler barrel, the other beneath the platform. The coal boxes are set at the sides of the platform with a passageway between, a valuable improvement, allowing the operator more room in which to handle his fire tools..

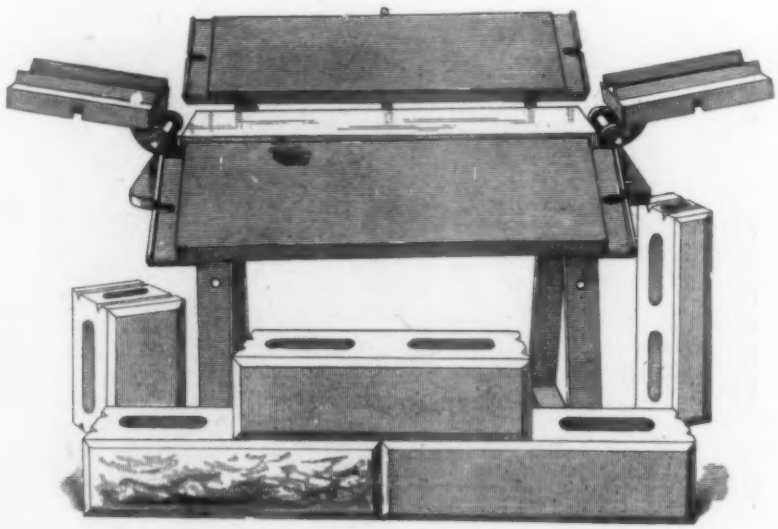
The engine is Duplex. For the purpose of operating a machine which is constantly stopped and reversed, the double engine makes possible advantages that one engine cannot give.

The two-speed-gear has been discarded. The same speed and power results are obtained by adopting an intermediate velocity ratio, by slightly increasing the cylinder bores and by constructing the boiler for higher steam pressure. Thus by steam pressure and throttle control the engine can deliver, through this gearing, the speed and power changes desired, which, as a fact, are very slight.

The Use of Bituminized Fiber Conduits.

The bituminized fiber conduit of the American Conduit Company was first tried experimentally for carrying electric wires underground in California seven years ago, and, having proved satisfactory in every way, it was then introduced into Chicago and the Middle States, and later it was introduced in the East. It is

now in general use in California, in extensive use in the Middle States, and is making fine progress in the East. It is used by the United States government in the navy yards on the Atlantic and Pacific, in the War Department, in the fortifications at New London, Conn., and in the Congressional Library at Washington, D. C.; by Topeka & Santa Fe railroad; by the University of Chicago; by the Western Union Telegraph Company, in many cities; by the Pennsylvania Railroad Company; by the Anaconda Copper Company, at Butte; by the Pacific States Telephone Company, in almost all the Pacific Coast cities; by the Elgin & Aurora Traction Company at Elgin, Ill.; by the Colorado Fuel and Iron Company, at Denver, Col.; by the Edison Electric Company, in Southern California cities; by Professor William Libby, of Princeton, N. J., one of the most prominent electricians in the country, and by many big institutions of which space will not permit mention here.



THE GOODWIN HOLLOW CEMENT BLOCK MACHINE.

The Goodwin Concrete Block Machine.

The Goodwin hollow concrete block was patented in August, 1903, and patents on the machine for making it were allowed in March of this year, so that it is one of the latest arrivals in the fertile field of concrete block construction.

An accompanying cut shows clearly the simplicity of the machine, the only parts not shown in the picture being the cores for the vertical hollows seen in the blocks lying at the base of the machine, and the bar for producing the horizontal ventilation openings seen in the two blocks standing on end at either side of the machine, the latter being the new feature of this block.

In operating the machine the cores are set on the pallet seen above the table in the cut, the ends and sides are turned up and clamped by attached or independent clamps, the horizontal bar is slipped through openings in the ends and the cores so that the latter are fixed in position. The mold is then tamped full of cement concrete, the horizontal bar is pulled out, each core is lifted out by means of a hook engaging a slot in the top, the sides and ends are dropped and the block is lifted out on its pallet by hand or by double hooks, through the upper bend of which a rod can be passed for ease in carrying, if desired. The cores have a half-inch taper, being smaller at the bottom for ease in drawing out.

It will be observed that each side and each end is hinged to and supported on two rods. These rods pass through slots in the top of the table and can be moved forward and back to vary the width or length of blocks. The rods can also be varied in height by means of set screws and the clamping screws of the above mentioned motions, to suit the position

taken by the upper surface of the pallets.

With eight rock face side plates and five end plates varying from 6 to 14 inches, many forms and sizes of the rock face blocks can be made. For plain and bevel edge blocks sliding end plates are provided so that any lengths of block from 3 to 18 inches, varying by ¼-inch steps, can be made. Blocks of any width from 3 to 18 inches can also be made, extension rods being used for the wider blocks. A machine may be provided with the accessories for making only blocks of nine inches depth, but the standard machine has also those for making the same blocks with six inches depth.

Porch columns and chimney blocks with one or two flues and octagon blocks can be made of any size and with rock faces all around if desired.

The accompanying photograph shows many of the forms and sizes of blocks which can be made on this machine. It is evident that, with a minimum of trouble and loss of time any desired variations in size, pattern of face and form can be made. The triangular or rounded indentations seen on the ends of the blocks are for the insertion of proper strips or blocks for holding door and window frames and the like in place. They can be filled with mortar in laying blocks and thus serve to hold blocks firmly in their places in the wall. The horizontal ventilation holes are very convenient in laying blocks. Hooks inserted in the veritical hollows engage the edges of the horizontal hollows and the blocks can be lifted by them and set exactly to place in one motion, which cannot be done with many other forms of hollow blocks.

Mr. Goodwin is a practical pattern-maker and is continually adding to his stock of patterns for attachments to the machine. He now furnishes about 140 pieces for use with the 6 and 9-inch molds, and can supply promptly any special forms which may be fancied or found necessary for particular cases. A circular will be sent on application by H. E. Goodwin, 208-210 Blake-st., Indianapolis, Ind. A larger catalogue is in preparation.

Mr. Goodwin is now prepared to make hollow concrete blocks to supply the local trade and at the same time to demonstrate the operation of the machine to prospective purchasers in other localities.

THE PRODUCT OF THE GOODWIN BLOCK MACHINE.

Term Bitulithic Is Proprietary.

Suit has been filed at Detroit, Mich., by Warren Brothers Company of Boston, Mass., against the Barber Asphalt Paving Company, asking for an injunction restraining the latter company from using the word "bitulithic" in its bids, or from bidding or offering to bid on the so-called "bitulithic" paving. Warren Brothers Company claim that it coined the word "bitulithic" and that it has created a demand for bitulithic pavement

at a cost of at least $400,000. Pending the hearing of the suit Judge Hosmer has granted the plaintiff company a temporary injunction.

Trade Publications.

Bulletin No. 9 of the Jeffrey Mfg. Co., Columbus, O., gives instructions for the care and operation of their direct current electric generators.

The Link-Hark concrete block machine is fully described and illustrated and its good points are shown in a neat booklet issued by the Link-Hark Mfg. Co., Bloomington, Ill.

The Indian Asphalt Company, Railway Exchange Bldg., Chicago, Ill., issues a pamphlet containing much valuable information about gum asphaltum, asphalt paint, mastic, waterproofing, roofing, pipe dip, bituminous concrete, asphalt pavement, maltha and asphalt flux.

The Century rubber belt conveyor and all its appliances are illustrated and described in catalogue No. 67 A of the Jeffrey Mfg. Co., Columbus, O.

A new pamphlet issued by the American Cement Co., Philadelphia, Pa., bears the significant title, "The Test of Time," and shows how Giant Portland cement meets the test. This company was founded twenty years ago.

Bulletin No. 9 of the De Laval Steam Turbine Co., Trenton, N. J., gives results of tests of the turbines manufactured by this company.

The Penn-Allen Portland Cement Company, Allentown, Pa., J. Maxwell Carrere, General Manager, issues an illustrated pamphlet describing the modern plant which this company has erected at Penn-Allen, near Nazareth, Pa., and giving results of tests and chemical analyses by various chemists and engineers, which show its quality.

"Sterilization and Filtration of Water Supplies, Ferrochlore Process and Howatson's System," is the title of a pamphlet issued by Andrew Howatson, 1 Rue-St. Pierre, Neuilly, Paris, France, containing extracts from official reports of the French government, the Belgian government and the city of Paris.

Trade Notes.

ASPHALT.

The plant of the Barber Asphalt Company at Philadelphia was damaged by fire Aug. 16, entailing a loss of $50,000.

The John J. Peters Company of Belvidere, Ill., has purchased a new semi-portable asphalt plant of Hetherington & Berner of Indianapolis. The plant will be delivered about Sept. 1.

In digging a well at Atoka, I. T., a four-foot vein of asphaltum was found, which is said to be of the same quality as the Jumbo asphaltum taken from the Jumbo mine, about twenty miles from Atoka.

The establishment of a permanent asphalt plant in Tacoma, Wash., has been commenced by the Barber Asphalt Paving Company. Offices has been established in the Provident Building with S. T. Young of Seattle as manager.

A rich deposit of asphalt and lead has been discovered on the Jesse Gardner plantation, near Durant, I. T. The deposit is within eighteen inches of the surface, and preparations are being made for the examination and development of the asphalt.

The establishment of a plant at Cincinnati, O., for the manufacture of asphalt blocks 4x4x12 inches in size, under the management of John J. Geghan, mineral expert, is contemplated. The blocks are to be made from Kentucky rock asphalt from Logan, Edmonson and Butler counties.

The department of the interior at Washington, D. C., is inviting bids for the purchase of unleased segregated coal and asphalt lands and unleased segregated coal and asphalt deposits as follows: Tracts within the McAlester district (No. 1), 2 p. m. Oct. 3; Wilburton-Stigler district (No. 2), 2 p. m. Dec. 5; Howe-Poteau district (No. 3), Feb. 6, 1905; McCurtain-Massey district (No. 4), 2 p. m. April 3, 1905; Lehigh-Ardmore district (No. 5), 2 p. m. June 5, 1905; in District No. 6, 2 p. m. Aug. 7, 1905. A. C. Tonner, acting commissioner.

BRICK.

The Granite Brick Company, Des Moines, Ia., is rebuilding and enlarging its plant.

The Thornton Fire Brick Works, Thornton, W. Va., began manufacturing paving brick on June 15.

The Table Rock Clay Company, Table Rock, Neb., will erect a new plant. New machinery has been ordered.

The Metropolitan Paving Brick Company, Canton, O., was incorporated Aug. 5 by Harry G. Renkert, C. W. Keplinger, James H. Barbour, Jacob J. Renkert and George R. Shane.

The Oxford Fire Brick Company, Anniston, Ala., has equipped its brick plant and is now manufacturing vitrified paving brick, fire brick, etc. The company desires to secure a competent representative in each state of the southern district.

CEMENT.

The Badger Mold Company, Madison, Wis., has a new mold for making hollow concrete blocks.

A new cement plant is about completed in Mentor, Campbell county, Ohio. The company is backed by eastern capital.

The erection of a cement mill at

Okeene, Ok., is contemplated by eastern capitalists, according to press reports.

The Adams Cement Company, Grand Rapids, Mich., will erect a two-story cement building on Madison-ave., near Hall-st., at a cost of $6,500.

The Union Portland Cement Company's New Jersey charter has been admitted to the state of Ohio, with offices at Rushsylvania. J. L. Ballinger, agent.

The Consolidated Rosendale Cement Company, Kingston, N. Y., is installing a plant for the manufacture of heading in its Whiteport mill, formerly the property of the Newark and Rosendale Cement Company.

The Gypsum Products Company has taken out incorporation papers under the laws of the state of New York. The incorporators all of York, Pa., are: W. F. Ray Stewart, Grier Hirsch, L. Love, H. S. Wiest and Charles C. Frick.

A deposit of natural cement has been discovered in Pueblo county, Colorado, in the Greenhorn region, about eighteen miles from Pueblo. A company is being organized by George Marsh, George Clark, F. C. Gilbert, George Hubbard and Graham West.

Howell & Ash of Oklahoma City, Ok., have purchased the gypsum plaster manufacturing plant near Watonga, Ok., for $48,000 from Cronkhite Bros. The sale includes two quarter sections of gypsum deposit lands and leases of the allotments of several Cheyenne Indians.

Yegen Bros., Inc., Billings, Mont., advise us that they believe they have material suitable for making cement, and desire the address of an expert to make analyses of the material. They also desire names of manufacturers of machinery and supplies for cement plants.

The Tennessee Portland Cement Company has been organized and plans for a plant to be erected about sixty miles from Nashville have been completed. The incorporators are: R. T. Van Valkenburg, Laporte, Ind., formerly general manager of the Toledo Portland Cement Company; James Palmer and Joseph Frank, Nashville.

CONCRETE BLOCKS.

L. R. Davis, Centerville, Ia., will erect a cement block plant.

Cement blocks are being manufactured by G. Scheurenbrand at Mitchell, S. D.

Honniwell & Truck, Hartford, Wis., are manufacturing cement building blocks.

John A. Shransky of Pukawana, S. D., has made application for a patent on a cement post.

A cement stone plant will be erected at Renville, Minn., by H. A. Pinch and W. C. Kolwinsky.

Cement building blocks are being manufactured at Grand Rapids, Mich., by Freestone & King.

A company is being organized at Hammond, Minn., to manufacture building blocks, and perhaps sidewalk blocks.

Louis Thompson and Thomas Wright, Marshfield, Wis., will engage in the manufacture of hollow building blocks.

W. H. H. Wood, 88 W. Winter-st., Delaware, O., advises us that he is a possible purchaser of a machine for making cement blocks.

The Nevada Artificial Stone Company, Nevada, Ia., has been organized to make cement building blocks. E. H. Dewel is secretary and manager.

The lumber yards of Litchfield, Minn., have made arrangements to handle the retail sales of cement blocks made by the Litchfield Stone factory.

Evanstad & Finley, Lakota, N. D., will manufacture building blocks under the patents of the Miracle Pressed Stone Company of Minneapolis.

The Concrete Machinery Company, Fenton, Mich., will erect a plant two-stories high and 40x100 feet of cement bricks and concrete blocks.

The Concrete Construction Company, Ashland, Wis., is furnishing building blocks for the Werder Block, the Hosmer Block and Boston restaurant.

The Acme Stone Cement Company, Cleveland, O., has been incorporated by W. H. Otto, N. C. Stevens, T. R. Tease, Charles Gohleke and J. M. Patton.

A plant will be erected on the East Side, near the corner of Mt. Vernon and Monroe-aves., Columbus, O., for the manufacture of hollow concrete blocks.

The Culp Paving Company, Chicago, Ill., has been incorporated to conduct cement construction and paving business by Ira H. Culp, C. C. Bechtold and A. F. Holmes.

The New York Cement Block Company, New York City, has been incorporated by W. F. Thompson, J. J. Burbridge of New York City, and Katherine Collinan of

T. Gaddis and H. Lord have purchased a two-thirds interest in the cement stone business of E. C. Cchnebly of Seymour, Ia., and the business will be conducted as the Seymour Cement Stone Company.

The Sheboygan Cement Building Block Company, Sheboygan, Wis., has been organized to erect a plant for the manufacture of cement building blocks under the patents of the National Cement Company.

The Durolithic Company, North Tonawanda, N. Y., has been incorporated to manufacture cement building stone by John A. Rafter, George F. Fisher of N. Tonawanda, and Ed. H. Hubman of Tonawanda.

The Cosmic Cement, Tile and Stone Company, Baltimore Md., has been incorporated to deal in stone, tiles, cement, etc., by James F. Morrison, Pierce B. Wilson, jr., Morrill N. Packard, S. H. Calkins and Duncan MacCalman.

The Cement Block Building Company, Pittsburg, Pa., has been incorporated by O. A. Potts, H. C. Clark and Charles S. Graham. The company will build a plant having a capacity of 600 blocks a day, and will make a specialty of sills and window ledges.

PURCHASE OF MATERIALS.

Mortimer E. Kean, 3 Race-st., Cumberland, Md., advises that he is a possible purchaser of cement, sandstone, etc.

W. E. Reynolds, arch., Green Bay, Wis., advises us that he is interested as a possible purchase of all kinds of materials.

The Phoenix Brick and Construction Company, St. Joseph, Mo., advise us that they are in the market as purchasers of cement, rock or gravel.

LIGHTING AND POWER.

The Central Power Manufacturing Company, Buffalo, N. Y., has been incorporated to manufacture electricity by C. R. Huntley, William R, Huntley and D. T. Nash.

The Windsor Locks Electric Light Company, Hartford, Conn., was sold Aug. 17 to Thomas C. Perkins, who will enlarge the steam plant and increase the water power.

The Southern Electric and Manufacturing Company, Anniston, Ala., has been incorporated and will erect at once a plant for the manufacture of electric goods. Frank G. Lake, president.

The Cherokee Development and Manufacturing Company, Birmingham, Ala., has been incorporated to build an immense power plant on the Tallapoosa river and furnish electric power to the city of Birmingham.

Newly incorporated companies: Citizens' Light, Heat and Power Company, Sidney, O.; Wayne Gas and Oil Company, Buffalo, N. Y.; Forde Lighting Company, Garrettsville, O.; Illinois Illuminating Company, East St. Louis, Ill.

The Warner Arc Lamp Company, Muncie, Ind., has been incorporated and will erect a large plant for the manufacture of the Warner arc lamp. The directors are William F. Warner, Clyde Warner and William F. Rawlins.

The Harden Gas Company, Birmingham, Ala., has been incorporated to manufacture a gas appliance which will do away with smoke from soft coal. The incorporators are W. T. Harden, G. N. Rausschenburg, Frederick Bruckers and John H. Pritchard.

Hubbardston, Mass., which has had two automatic incandescent lights of the Automatic Incandescent Light Company, Northboro, Mass., in use for some months, has voted unanimously at a special town meeting called for the purpose to light the town entirely with these lamps.

MISCELLANEOUS.

The Austin-Western Manufacturing Company, Chicago, Ill., has sold a street sweeper to the city of Guthrie, Ok.

The plant of the Rex Filter Manufacturing Company, Pittsburg, Pa., was damaged by fire Aug. 15, entailing a loss of $5,000.

The National Steel Truss Concrete Company, New York City, has been organized by John B. Oakley, W. F. Winston and E. E. Woodruff.

The Foundation and Contracting Company, 35 Nassau-st., New York City, has changed its name to the Foundation Company for brevity and to save confusion.

The Dopp Water Purification and Softening Company, Buffalo, N. Y., has been incorporated by William H. Dopp, Geo. H. Dunbar, Maurice B. Patch, George L. Lewis and Ansley D. White.

The American Water Purifying Company, Camden, N. J., has been incorporated to purify water and manufacture machinery for that purpose. The incorporators are Albert H. Bryant, Daniel M. Yarnell and Oswald Calvert.

The Buckeye Engineering and Construction Company, Columbus, O., has been incorporated to build roads and bridges and to do a general contracting business by J. J. Walcutt, D. E. Ritchie, Z. E. Amlin, William A. Wells and C. H. Walcutt.

The Commonwealth Water Improvement Company, Camden, N. J., has been incorporated to build, enlarge and install works or plants of public or general use and utility. The incorporators are I. H. Hicks, Edward Fell Lukens, William S. Wallace and George H. Martin.

The C. O. Bartlett and Snow Company, Cleveland, O., advise us that they have recently received orders for the following: City of Winnipeg, Manitoba, one four compartment direct heat rotary dryer, capacity 100 tons of sand a day; Silver Cup Mines, Ltd., Ferguson, B. C., one single cylinder direct heat rotary dryer, using the waste heat from ore roasters, capacity 50 tons of slimes a day; James Kirk & Co., one steam dryer; Washington Carbon Company, complete outfit conveying and elevating machinery for their new plant at Wellsville, W. Va.; Semi-Steel Company, Cleveland, O., elevating and conveying machinery for large brick plant to be erected at St. Paul, Minn.

Studebaker Bros.' Manufacturing Company, South Bend, Ind., have announced that Col. George M. Studebaker will relinquish Jan. 1, 1905, the management of the carriage department and become more closely identified with the executive department, and, as president of the Studebaker Automobile Company, give special attention to the direction and development of that business. E. Louis Kuhns will relinquish the management of the sales department and assume the management of the spring vehicle factories. Lloyd F. Weaver will give up the management of the San Francisco branch and assume the management of the sales department at the home office. Chester N. Weaver will become the branch manager at San Francisco.

The plant of the Stilwell-Bierce and Smith-Vaile Company, Dayton, O., is to be sold at public auction to satisfy creditors by order of Judge A. C. Thompson of the United States district court. The company was organized in November, 1892, as a New Jersey corporation. It manufactured machinery for cottonseed, linseed and coal oil mills, air compressors, steam and power pumping machinery, filter presses, feed water heaters and purifiers, power transmitting machinery and Victor turbines. The company failed in January, 1904, and two receivers were

appointed. The liabilities of the company are placed at $1,250,000 and the appraised assets are $1,200,000, exclusive of the accounts receivable, which amount to several hundred dollars.

SEWER PIPE.

The Mexican Sewer Pipe Company has been organized at the City of Mexico to take over and increase that capacity of the Mexican Clay Company's plant at Santa Julia, Mexico. J. H. King is president of the new company. The company will change from steam to electrical power.

A new clay working plant will be established at Huntingburg, Ind., which will manufacture pottery ware, sewer pipe and other clay products. A. Stratman, J. W. Lewis, J. V. Stimson and others are interested.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Chicago, Ill.—The Board of Public Improvements is experimenting with three kinds of paving, creosoted wood blocks, brick and bitulithic pavement.

Bellingham, Wash.—An experimental road will be constructed in this city, under the supervision of J. W. Abbott, highway commissioner of the department of agriculture, and J. H. Dodge, road expert of the department.

Dowagiac, Mich.—The Central Bitulithic Co. of Detroit will ask for an injunction restraining the common council of this city from signing a paving contract with F. N. Kemp & Son of Middletown, O., on the ground that the bids were illegally worded.

CONTEMPLATED WORK.

Red Jacket, Mich.—Paving is contemplated.

New York City—Bids will be advertised soon for repaving twenty-five streets.

Clinton, Ia.—Plans and specifications for macadamizing Hickory-st. have been filed.

Wooster, O.—An ordinance has been passed to pave E. North-st., from Beall-ave. to Spink-st.

Newark, O.—The city council has passed an ordinance to pave the west end of Granville-st.

Missoula, Mont.—An ordinance has been introduced providing for cement walks in various parts of town.

Fort Wayne, Ind.—A resolution has been passed for paving S. Broadway from Scott-ave. to the bridge.

Duluth, Minn.—Petitions are being circulated for paving Mesaba and Piedmont-aves. and W. Superior-st.

Jefferson City, Tenn.—The question of constructing a system of graded roads will probably be considered soon.

Montgomery, Ala.—An ordinance has been passed for constructing hexagon block sidewalks on certain streets.

Garner, Ia.—The city council has decided that all street crosswalks hereafter constructed shall be of cement.

Nashua, N. H.—A resolution was passed Aug. 22 appropriating $1,500 for repairing and improving Pond-st. Mayor Doyle.

Taylorville, Ill.—Ordinances have been passed for paving parts of Clay, Cherokee, Franklin, Webster and Vine-sts.

Chicago, Ill.—The board of local improvements decided, Aug. 4, upon 22 miles of street paving in the Fifth and Seventeenth wards.

Braceville, Ill.—An ordinance has been passed providing for cement concrete sidewalks on Main-st. Walter Bath, vil. clk.

Des Moines, Ia.—Paving is contemplated for W. Walnut-st., but the property owners are undecided between brick and asphalt.

Petersburg, Va.—The finance committee of common council contemplates expending $70,000 on the improvement of sidewalks and roadways.

Benton Harbor, Mich.—The question of macadamizing the street between the Union Depot and Paw Paw-st. is being agitated by the press.

Guthrie, Okla.—The committee on ordinances has been directed to prepare an ordinance for paving an alley back of Oklahoma-ave. from Division to First-sts.

Troy, N. Y.—The city engineer has been directed to prepare plans and specifications for paving Union-st. alley from Fulton to Grand, with brick.

Belvidere, Ill.—An ordinance was passed Aug. 15, providing for macadam paving on Pleasant-st., between State and Pearl, and for building sidewalks.

Burlington, Ia.—A resolution has been approved by the Mayor providing for the construction of sidewalks on several streets. C. W. Droegemeyer, cy. clk.

Urbana, O.—Ordinances have been

adopted for grading and graveling and constructing concrete curbs and gutters on Louden-st., and constructing concrete walks on Scioto-st.

Atlantic City, N. J.—The railroad company has agreed to pay $200,000 toward paving Atlantic-ave., and City Engineer Hackney has been directed to prepare plans and specifications for paving with asphalt and other material.

Delaware, O.—Special.—J. S. Dike, cy. engr., says that the city council will probably pass an ordinance soon to pave parts of Sandusky and Winter-sts., requiring between 18,000 and 20,000 sq. yds. of paving and about 5,000 lineal feet of curbing.

Cambridge, Mass.—Council has adopted an ordinance authorizing the superintendent of streets to expend the unexpended balance of the $29,600 recently appropriated for the construction of Madison and other streets, in the construction of Magoun, Warren and Third-sts.

St. Paul, Minn.—An ordinance was passed Aug. 18 providing that all preliminary and final orders for paving shall specify a patented material. The board of public works is directed to call for bids on the patented material and also on asphaltum, sandstone, granite and brick.

CONTRACTS TO BE LET.

Ukiah, Cal.—Bids are asked until Sept 7 for constructing the Covel Road. Bd. supvrs.

Chillicothe, Mo.—Sealed bids are asked until Sept. 8 for 17,000 sq. yds. of paving. E. C. Orr, cy. clk.

Salem, Ind.—Sealed bids are asked until Sept. 5 for constructing certain roads. Frank E. Morris, co. audt.

Greenville, O.—Bids are asked until Sept. 3 for improving certain roads in Paterson twp. G. Warner, co. surv.

Ottawa, O.—Bids are asked until Sept. 3 for constructing Blosser and Simon stone roads. O. C. Talbott, co. engr.

Greensburg, Ind.—Bids are asked until Sept. 5 for constructing several gravel roads. Frank E. Ryan, co. audt.

Rockville, Ind.—Sealed bids are asked until Sept. 7 for constructing gravel roads. J. H. Kerr, chmn. co. comrs.

Barnesville, O.—Bids will be received until about Sept. 15 for paving South-st. with brick. E. M. Wilson, vil. clk.

Des Moines, Ia.—Sealed bids are asked until Sept. 6 for curbing a number of streets. W. W. Wise, chmn. B. P. W.

Pomeroy, O.—Sealed bids are asked until Sept. 5 for paving Front and Salt-sts. with brick. Abe A. Massar, vil. clk.

Brownstown, Ind.—Bids are asked until Sept. 5 for constructing 18.7 miles of gravel roads. A. H. Manuel, co. audt.

Logansport, Ind.—Bids are asked until Sept. 5 for paving N. Third-st., from Third to Twelfth, with asphalt. W. A. Osmer, cy. engr.

Glens Falls, N. Y. — Sealed bids are asked until Sept. 5 for a retaining wall and granite paving. George P. Slade, vil. engr.

Warren, Pa.—Bids are asked until Sept 10 for constructing 28,745 feet of road in Hickory twp. State Highway Dept., Harrisburg.

Lebanon, Ind. — Sealed bids are asked until Sept. 5 for improving Hamilton-st., from Sycamore to Noble, 1,073 ft. E. B. Herod, cy. clk.

Brazil, Ind.—Sealed bids are asked until Sept. 5 for grading, graveling and macadamizing certain roads. Jacob Luther, chmn. co. comrs.

Xenia, O.—Sealed bids are asked until Sept. 8 for paving Detroit-st. from the north to the south corporation line. J. E. Jones, clk. B. P. W.

Indianapolis, Ind.—Sealed bids are asked until Sept. 2 for paving the sidewalks on Beecher-st. with cement. Until Sept. 5 for grading and graveling the roadway of Cable-st., from New York to Vermont-sts.; grading the roadway of the first street west of Big Eagle Creek; constructing cement sidewalks on McLain and Drake-sts. M. A. Downing, chmn. B. P. W.

Omaha, Neb.—Sealed bids are asked until Sept. 2 for an asphalt paving and repair plant to be owned by the city. Andrew Rosewater, cy. engr.

Columbus, Ind.—Sealed bids are asked until Sept. 6 for constructing 1 mile of macadam road in Rockcreek twp. John Gant, chmn. co. comrs.

Harrisburg, Pa.—Bids are asked until Sept. 2 for constructing 1,338 lin. ft of road in Smithfield twp., Huntington county. Jos. W. Hunter, State Highway Comr.

Cincinnati, O.—Sealed bids are asked until Sept. 6 for macadamizing the roadway of the Grandin road viaduct over Delta-ave. J. P. Gerstle, acting clk. B. P. S.

Yuma, Ariz.—Bids are asked until Oct. 3 for constructing a road from Kofa to Quartzite via Yaqui Tank, Alama Springs and New Weaver Springs. C. P. Cronin, clk. bd. supvrs.

Logansport, Ind.—Sealed bids are asked until Sept. 24 for constructing cement sidewalks along Eel-ave., from Third to Fourth-sts., and High-st. from Eighteenth to Twenty-fourth. Mayor Vaughn.

Bloomington, Ind.—Bids are asked until Sept. 6 for grading and macadamizing W. Howe-st., from Madison to Fairview, and constructing walks on both sides of the street. Mayor Dunn.

Glenville, O.—Sealed bids are asked until Sept. 5 for constructing a macadam roadway in Brighton road, between Doan-st. and Lake Shore boulevard. C. C. Collacott, prest. B. P. S.

Wabash, Ind.—Sealed bids are asked until Sept. 12 for paving the first alley south of Water-st., from Wabash to Miami-sts., with brick, and macadamizing Stitt-st. Fremont McLees, cy. clk.

Crawfordsville, Ind.—Sealed bids are asked until Sept. 5 for paving an alley with brick and constructing cement sidewalks on Seminary-st., from College to Jefferson. H. B. Hulett, cy. clk.

Webb City, Mo.—Sealed bids are asked until Sept. 5 for vitrified brick paving as follows: Allen-st., 8,306 sq. yds.; Daugherty-st., 4,042 sq. yds.; Main-st., 3,422 sq. yds. W. E. Smith, cy. engr.

Paterson, N. J.—Sealed bids are asked until Sept. 2 for grading and macadamizing E. Twenty-seventh and E. Thirtieth-sts., Goffle Hill road, Randolph-ave. and Oldham road. E. N. Kevitt, dir. bd. chosen freeholders.

Richmond, Ind.—Sealed bids are asked until Sept. 5 for grading and graveling the roadway of Liberty-ave. and S. Fifth-st.; paving alley with cement; building cement walks on N. G-st. John F. Taggart, cy. clk.

Youngstown, O.—Sealed bids are asked until Sept. 2 for paving Wilson-st., from E. Federal-st. bridge to Shehy-st.; Elm-st., from Madison to Park-aves.; grading Worthington, Wirt and Livingstone-sts. and Grandview-ave. G. T. Prosser, clk. B. P. S.

St. Louis, Mo.—Sealed bids are asked until Sept. 6 for reconstructing several streets by removing gutter and crosswalk pavement and laying base of Portland cement concrete and layer of new macadam; paving number of streets with vitrified brick, with grading, granite curbing, etc. Hiram Phillips, chmn. B. P. I.

CONTRACTS AWARDED.

Vincennes, Ind.,—W. L. Brocksmith was awarded the contract for gravel road extension, for $6,207.

Ashland, O.—The contract for paving the streets with brick was awarded to Francesco Bros. of Ironton.

Sidney, N. Y.—The contract for paving Main-st. with brick was awarded to Allen & Co. of Oneida, for $11,098.15.

Marion, Ind.—The contract for street paving was awarded to C. A. Micheals of Kankakee, Ill., for $50,000.

Kansas City, Mo.—The Barber Asphalt Paving Co. was awarded contracts, Aug. 17, for paving six streets for $29,804.59.

Logansport, Ind.—The contract for paving Sixth-st. from Market-st. to the bridge, was awarded, Aug. 17, to Jerry Kerns.

Bluffton, O.—The contract for paving Cherry-st. was awarded to A. J. Bogart of Columbus Grove, for about $12,000.

Washington, Ill.—The contract for constructing six blocks of concrete walks was awarded to Jansen & Co. of Peoria.

Danville, Ill.—The contract for paving Washington-st. with brick was awarded to Johnson & Spandau, at $1.20 a sq. yd.

Toronto, O.—The contract for paving N. Fourth-st. has been awarded to Rinehart Bros. of East Liverpool, for $6,198.50.

Birmingham, Ala.—Dunn & Lallande secured the contract, Aug. 19, for paving Highland-ave. with creosoted wooden blocks

Dunkirk, N. Y.—The Barber Asphalt Paving Co. of Buffalo was awarded the contract, Aug. 2, for paving Deer and Eagle-sts.

Rensselaer, N. Y.—John McClellan was awarded the contract for paving First-alley or Academy-st. with cobblestones, for $972.40.

Freedom, N. Y.—The contract for grading, paving and curbing Eighth-st. was awarded to the Logan Coal Co. of Rochester, for $4,129.

Jackson, Mich.—The contract for paving Jackson-st. with bitulithic pavement was awarded to the Central Bitulithic Co. of Detroit.

Jacksonville, Ill.—The contract for paving W. Court-st. with brick, with Berea curbing, was awarded to John Cherry, jr., for $3,767.

Peoria, Ill.—The Crescent Stone Co. has been awarded the contract for paving the alley in the rear of the hospital, for $1,049.80.

Ridley Park, Pa.—The contract for constructing cement sidewalks along Chesterpike was awarded to Edmund Stewart of this borough.

Covington, Ky.—The contract for grading and paving Scott-st., between Twelfth and Eighteenth-sts., with brick, was awarded to J. G. Collopy & Co.

Newark, N. J.—The contract for constructing granite paving on New Jersey Railroad-ave. was awarded to J. Roosevelt Shanly, for $49,496.

Sarnia, Ont.—The contract for paving Christina-st. with brick was awarded to A. J. Murphy, of Port Huron, Mich. Canton brick will be used.

St. Paul, Minn.—Fielding & Shepley have been awarded the contract for paving E. Fourth-st., from Broadway to Kittson, with sandstone, for $28,950.

Dowagiac, Mich.—The contract for paving Front, Beeson and Commercial-sts. with brick was awarded, Aug. 15, to F. N. Kemp & Sons, of Middletown, O.

Little Rock, Ark.—The contract for paving 10 blocks of streets with asphalt was awarded, Aug. 15, to the Arkansas Rock Asphalt Co., of this city.

Omaha, Neb.—The Nebraska Bitulithic Co. was awarded the contract for repaving Thirty-second-st., from Woolworth to Lincoln-aves. with bitulithic pavement.

Peoria, Ill.—The contract for constructing new concrete walks in the business part of this city has been awarded to John Banson & Son, of Bloomington.

Salem, O.—The contract for paving Lincoln-ave with brick was awarded to J. A. Smith, of Lisbon, at $1.61 a sq. yd., including Berea stone curbing.

Pine Bluff, Ark.—I. P. Shelby was awarded the contract, Aug. 16, for paving about twenty-eight blocks of streets with brick or concrete foundation for $57,000.

Rosedale, Kas.—The contract for paving Southwest boulevard, between Shawnee-ave. and the State line, was awarded, Aug. 2, to Warren Bros. Co., of Boston.

Ottumwa, Ia.—The contract for paving E. Second and S. Green-sts. and certain alleys with brick was awarded to the McCarthy Improvement Co., of Davenport.

Akron, O.—J. M. Davidson was awarded the contract for paving Allen-st., Aug. 10, for $13,288, and Hallinan Bros. the contract for paving Upson-st. for $3,260.

Birmingham, Ala.—The Crockett Paving Co. was awarded the contract, Aug. 17, for paving Eighteenth-st. and Morris

and First-aves. with vitrified brick, for $63,484.50.

Chicago, Ill.—The contract for paving State-st., from Madison to Jackson boulevard, with asphalt, was awarded, Aug. 12, to the R. F. Conway Co., for $34,000.

Muskegon Heights, Mich.—The contract for improving two blocks of Peck-st. with cinders was awarded, Aug. 19, to the Eggert Transfer Co., for twenty-five cents a square yard.

Rockwood, Tenn. — The contract for constructing sidewalks was awarded to Joe P. Watts, Aug. 18. The brick will be furnished by the Brick & Tile Co. of this city.

Brazil, Ind.—Fitzpatrick Bros. were awarded the contract, Aug. 17, for brick paving as follows: Cruzan-st., $3.50 a lin. ft.; Ridge-st., $3.37½; alley, $1.50.

Columbus, O.—James Westwater has been awarded the contract for constructing a macadam road along the east line of the Scioto dam reservoir lands, for $15,113.50.

Springfield, Ill.—John E. Bretz was awarded the contract, Aug. 16, for paving Douglas-ave. with brick at $1.43½ a sq. yd. for paving and 53c a lin. ft. for curbing.

Cedar Rapids, Ia.—The contract for macadamizing and graveling Seventh-st. was awarded to C. L. Beslen of this city, at $1.67 a sq. yd. for macadamizing and $1.40 for gravel.

Newark, N. J.—Warren Bros.' Company of Boston secured the contract Aug. 18 for paving Plane-st., between William and Court, and New-st., between Wilsey and Second, with bitulithic.

Rockville, Conn.—A. Brazos & Son of Middletown secured the contract for constructing a section of macadam road in the town of Vernon at $1.20 for Telford and $1.20 for macadam.

Muskogee, I. T.—The contract for paving the streets in the business section of this city with brick was awarded to the Oklahoma Paving and Cement Company of Guthrie Okla., at $1.69 a sq. yd.

Bluffton, Ind.—The contract for paving Johnson-st. from Washington to Townley, and from Market to Wabash, with brick was awarded Aug. 10 to C. E. Williams of East Aurora, N. Y., at $2.29 a sq. yd.

New York City.—The contract for repaving W. Seventy-second-st. from Central Park west to Riverside Drive, was awarded to the Hastings Pavement Company for $65,896. The asphalt pavement will be replaced with asphalt blocks.

Rochester, N. Y. — Paving contracts contracts were awarded Aug. 18 as follows: Bernard-st., brick, H. N. Cowles, $24,670; Montgomery-st., trap rock, Brayer & Albraugh, $4,792; Aldine-st., trap rock, Whitmore, Rauber & Vicinus, $11,946.

Omaha, Neb.—Parks, Johnson & Parks secured the contract for paving Thirtieth-st. from Q to Y with Purington brick, at $2.10 a sq. yd. The contract for artificial stone curbing on the same street was awarded to Dan Hannon at 39 cents a lin. ft.

Tacoma, Wash. — The Barber Asphalt Paving Company was awarded the contract for paving Yakima-ave. from Division-ave. to Steele-st. for $81,980. The contract for cement sidewalks along the same section was awarded to George Milton Savage for $11,487.

Albany, N. Y.—Paving contracts were awarded Aug. 8 as follows: Yates-st. from Quail to Ontario, John Doyle, $9,677.15; Third-st. from Northern Boulevard to Thornton-st., Edward F. Dillon, $12,113; Sherman-st. from Northern Boulevard to Lexington-ave., $9,710.

Des Moines, Ia.—Contracts were awarded Aug. 11 as follows: Paving Scott and Tenth-sts., King, Lambert & Co., $1.59 a sq. yd.; curbing Twenty-third-st. from Cottage Grove to Atkins, 31 cents a ft.; curbing Twelfth-st. from Center to School, J. G. Griffith & Co., 29 cents.

St. Joseph, Mo.—The contract for paving Eighteenth-st., from Messanie to Olive, with brick was awarded Aug. 16 to the Phoenix Brick and Construction Co.; re-macadamizing Fifteenth-st. from Sylvanie to Messanie, Fred Roth: macadamizing Twentieth-st. from Messanie to Francis, Rackliffe & Gibson.

Nashville, Tenn.—The contract for constructing a granite curb and sidewalk in front of the Nichol property on Cedar-st. was awarded to John Oman, jr., at $1.30 a sq. yd. The Cumberland Cement and Paving Company secured the contract for a granitoid walk on High-st. at $1.28 a sq. yd.

Richmond, Ind.—The contract for paving Ft. Wayne-ave with brick was awarded Aug. 16 to John F. Cronin for $9,879. Other contracts awarded were as follows: Grading, graveling and bouldering alleys, Henry Nolte, $1.07 and $1.23 a ft.; cement walks on S. Twentieth-st., John H. A. Schneider, 78c a ft.

Toledo, O.—The contract for repaving Huron-st., from Bush to Stickney, with brick on concrete was awarded to H. P. Streicher for $5,928.60. Other contracts awarded were: Wabash-st., from Division to City Park-ave., brick, H. P. Streicher, $5,928.60; Frederick-st., from Cherry to Lagrange, brick, William McMahon, $7,471.80.

Toronto, Ont.—Paving and sidewalk contracts have been awarded as follows: Concrete walks—Woodlawn-ave., Warren Bituminous Company; Wilton-ave., Queen City Concrete Company; Alice-st., Crescent Concrete Paving Company; Adelaide-st., Godson Contracting Company; Gilead Place, Gardner & Co. Bitulithic paving—Walker-ave., Warren Bituminous Company. Tar macadam—Riverton-ave., Godson Contracting Company.

Chicago, Ill.—Paving contracts were awarded Aug. 23 as follows: R. F. Conway Company—Blackhawk-st., asphalt, $26,692; California-ave., asphalt, $61,427; Campbell-ave., asphalt, $15,345; Chicago-ave., asphalt, $25,193; Garfield-ave., asphalt, $27,256. Standard Paving Company—Carroll-ave., asphalt, $11,866; W. Lake-st., asphalt, $62,035. Citizens' Construction Company — Commercial-ave.,

brick, $28,858; Waldo Place, granite, $10,279; W. Twelfth-st., asphalt, $19,911. Barber Asphalt Paving Company — Erie-st., asphalt, $72,852; Wilcox-st., asphalt, $22,968. M. H. McGovern—W. Fifty-seventh-st., macadam, $20,150.

Petaluma, Cal.—Special.—N. S. Frost, cy. engr., says contracts have been awarded as follows: Palmer & Pitts—Re-macadamizing Liberty-st., 50 cts. a lin. ft.; grading and macadamizing Bassett-st., 4½ cts. a sq. ft.; basalt block curbs, 15 cts. a lin. ft.; broken rock gutters, 9 cts, a sq. ft.; wooden box culverts, $20 each; grading and macadamizing Seventh-st., 6 cts, a sq. ft.; basalt block curbing, 15¼ cts. a lin. ft.; broken rock gutters, 9 cts, a sq. ft.; wooden box culverts, $20 each; grading 45,000 sq. ft. Fifth-st., $200; macadamizing, 3¾ cts, a sq. ft.; Redwood plank curbs, 11 cts. a ft.; gutters, 9 cts, a sq. ft. J. Werlin — Grading and macadamizing B-st., 6¾ cts. a sq. ft.; basalt block curbing, 15¼ cts. a lin. ft.; broken rock gutters, 9 cts. a sq. ft.; wooden box culverts, $17.50 each.

SEWERS.

Millville, N. J.—The New Jersey Board of Health has sent a letter to the Commercial Township Board of Health, which controls all the oysters dredged in Maurice River Cove, calling its attention to the pollution of water in Maurice Cove.

CONTEMPLATED WORK.

Salem, Mass.—A sewerage system is contemplated.

New Canaan, Conn.—A sewerage system is proposed.

Falls City, Neb.—A sewerage system is contemplated.

Findlay, O.—Plans for a trunk sewer are being prepared.

Salem, Ind.—The question of building a sewerage system is being considered.

Aylmer, Ont.—The question of constructing a sewerage system will be considered, Sept. 6.

Cape Girard, Mo.—Plans and specifications for a sewerage system have been prepared.

Hopkinsville, Ky.—Surveys are being made for a sewerage system by City Engineer McClain.

Mt. Gilead, O.—The question of constructing a sewerage plant is again being agitated.

Newark, N. Y.—Plans for a sewerage system will be prepared by T. E. Eberhart of Schenectady.

Hopkinsville, Ky.—The city engineer has been directed to make surveys for a sewerage system.

Denver, Colo.—Plans have been adopted for the Colfax-ave. special sanitary sewer district.

Sheridan, Wyo.—Plans for a sewerage system have been prepared by Andrew Rosewater of Omaha.

Laurens, S. C.—The question of issuing bonds for constructing a sewerage system will be voted on.

Los Gatos, Cal.—The question of constructing a sewerage system and septic tanks is being considered.

Lynn, Mass.—The establishment of a pumping plant for the trunk sewerage system is being considered.

Havre, Mont.—Plans and specifications for constructing main sewers in Districts 1 and 2 are being prepared.

Newport, Ore.—The question of establishing septic tanks at this place before next summer is being considered.

Indianapolis, Ind.—The matter of constructing a sewer system in Haughville and West Indianapolis will be considered Oct. 3.

Springfield, Ill.—The park board has decided to build the entire Washington Park sewer, 4,000 feet long. Cy. Engr. Hamilton.

Perry, Ia.—B. C. Dilenbeck, chm. sewer com., is asking for sealed bids for plans and specifications for a sewerage system.

New Albany, Ind.—City Engineer Coleman has been directed to make a survey of the proposed sewerage system emptying into the Ohio River.

Lexington, Ky.—An ordinance has been passed to submit to vote the question of issuing $100,000 bonds for constructing a sewerage system.

Mt. Vernon, Ia.—Special.—Plans and specifications for the sewerage system are being prepared by the Iowa Engineering Co. of Clinton, Ia.

East St. Louis, Ill.—City council passed, Aug. 15, the annual appropriation ordinance, which included $60,000 for the proposed outlet sewer.

Davenport, Ia.—Plans for a new sewerage system to be installed on the south side of the city are being prepared by City Engineer Wheelock.

Red Jacket, Mich.—The village council has instructed Engineer Scott to prepare plans for replacing the main storm sewer in Elm-st. by a brick sewer.

Perrysburg, O.—A resolution has been adopted providing for sewers and storm water drainage. The plans were prepared by Riggs & Sherman of Toledo.

Washington, D. C.—Maj. J. F. Case, City Engineer of Manila, P. I., has filed with the Secretary of War plans for the proposed sewerage and water systems.

San Pedro, Cal.—The Board of Trustees has directed City Engineer Whitman to prepare estimates of the cost of constructing main outfalls for a three-branch system.

Wyandotte, Mich.—The Board of Public Works approved, Aug. 18, the separate trunk sewerage system, plans for which were prepared by Riggs & Sherman of Toledo.

Jersey City, N. J.—The construction of a permanent relief sewer from the head of Thirteenth-st. to carry the sewage of Division-st. sewer into the Hudson River, is proposed.

Dyersville, Ia. — Special. — Plans and specifications for a complete system of sewers and grades are being prepared by

G. H. Merridith, cons. engr. of Cedar Rapids. E. D. Barrows.

Spencer, N. C.—The Board of Aldermen has authorized the water and sewer committee to receive proposals from persons or firms for engineering and constructing a sewerage and water works system. A. D. Smith, S. T. Dorsett, mem. com.

North Branch, Mich.—Special.—F. A. Sicklesteel, drain comr. and surv., says that a contract will be let in the near future for dredging about 7 mis. of drain 15 ft. at bottom and 6 ft. deep. The time for letting has not yet been determined upon.

CONTRACTS TO BE LET.

La Grange, Ind.—Bids are asked until Sept. 6 for constructing a drainage ditch. V. D. Weaver, co. audt.

Phillips, Wis.—Bids are asked until Sept. 3 for extending the sewerage system. John R. Graham, chm. st. com.

Nappanee, Ind.—Sealed bids are asked until Sept. 5 for constructing certain sewers. Q. G. Reinoehl, town clk.

Richmond, Ind.—Sealed bids are asked until Sept. 5 for constructing sewers in certain streets. John F. Taggart, cy clk.

St. Louis, Mo.—Sealed bids are asked until Sept. 6 for constructing 414-ft. of brick sewer, with manholes, inlets, etc. Hiram Phillips, prest. B. P. I.

Youngstown, O.—Sealed bids are asked until Sept. 2 for constructing sewers on Celeland-st. and Franklin and Crossman-aves. G. T. Prosser, clk. B. P. S.

Green Valley, Ill.—Sealed bids are asked until Sept. 2 for constructing about 9,000-ft. of 15-in. tile drain. Chas E. Schureman, chmn. comrs. drainage dist. No. 1.

Zanesville, O.—Sealed bids are asked until Sept. 1 for constructing all the sewers for the Northwestern sewer district No. 4. H. W. Shoots, secy. B. P. S.

Delphos, O.—Bids are asked until Sept. 8 for constructing 1,750-ft. of 4-ft. brick sewer, and 5,655-ft. of 24, 30, 33 and 36-in. pipe sewer. J. W. Fisher, clk. B. P. S.

Washington, D. C.—Sealed bids are asked until Sept. 5 for furnishing and installing one freight elevator and hydraulic engine at the sewage pumping station. H. B. F. MacFarland, chmn. Dist. Comrs.

Delford, N. J.—Sealed bids are asked until Sept. 6 for constructing a sewerage system, including about 5-mis. of vitrified pipe and specials, 90 manholes and 16 flush tanks. Aaron Ackerman, mayor; H. A. Bingham, boro clk.

CONTRACTS AWARDED.

Virginia, Minn.—The contract for sewer construction was awarded to James Dowling for $2,503.

Fairfield, Me.—The contract for a sewer on Western-ave. was awarded to J. L. Parkin & Son.

Nashville, Tenn.—The contract for a sewer in alley No. 438 has been awarded to Quinn & Ellis for $405.50.

St. Joseph, Mo.—Rackliffe & Gibson have been awarded the contract for constructing sewers in certain streets.

Roanoke, Va.—The contract for constructing the Campbell drain was awarded to the Roanoke Construction Co., for $19,894

Lansing, Mich.—Sewer contracts have been awarded as follows: Washtenaw-st., Jas. Black; Kalamazoo-st., J. H. Algate.

Miller's Falls, Mass.—The contract for 4,800-ft. of sewer was awarded to Edward B. Roberts of Swampscott, Mass., for $1,300.

Corning, Ia.—The contract for a sewer in an alley was awarded to Dunegan & Corey of Shenandoah, at 44 cts. a lin. ft.

Los Angeles, Cal.—The contract for constructing another section of the storm sewer system was awarded to Williams & Belzer.

Columbus, O.—Samuel A. Esswein has been awarded the contract for constructing the seewage disposal plant pumping station for $46,500.

Danville, Ill.—The contract for a sewer on Washington-st. from Park-ave to Park-st., has been awarded to Alpheus Cruzan at 14 cts. a ft.

Joliet, Ill.—The contract for constructing a sewer in Willow-ave. and McDonough-st. has been awarded to Robert Shannon for $2,759.93.

Terre Haute, Ind.—Sewer contracts have been awarded as follows: College-st., W. H. Harris, $4,287.40; Oak-st., Foulkes & Forbes, $4,583.57.

Delaware, O.—Special.—J. S. Dike, cy. engr., says that the contract for extending the sanitary sewer system was awarded to Charles F. Miller for $4,724.

Springfield, Ill. — W. A. Crumley was awarded the contract for a sewer in College-st. at 76 cts. a lin. ft., 40 cts. for 12-in. inlet sewer and $23 for manholes

Webster City, Ia.—The contract for a sewer in Division-st. has been awarded to Sullivan & O'Connor at $1.49 a lin. ft. and $44 each for manholes and catch-basins.

Urbana, Ill.—The contract for a new sewerage system was awarded to J. H. Palmer of Danville for $42,716.45, which includes the erection of the septic tank.

Corning, N. Y.—The contract for the construction of a section of the storm water sewers has been awarded to Evaline & Baltimore of Troy for about $25,000.

Chicago, Ill.—The contract for building the Seventy-ninth-st. sewerage system was awarded to the M. P. Byrne Construction Co. for $957,207.40. The contract involves the construction of 14 miles of concrete sewer.

Petaluma, Cal.—Special.—N. S. Frost, cy. engr., says H. LeCam was awarded the contract for constructing a 6-in. sewer, including manholes, on Fair-st., at 76 cts. a lin, ft., and on Bassett-st. at 74 cts. a ft

Holland, Mich.—Contracts for constructing sewers have been awarded as follows: Fifteenth-st., John J. Rens and John Vaness of Grand Rapids, $2,164.48; section 2 Fifteenth-st., Riemers Zuwedink, $1,505; Seventh-st., H. Oosling, $681.45.

Pittsburg, Pa.—Sewer contracts were awarded, Aug. 19, as follows: Jacob Minsinger, Augusta-st., from Rutledge to Greenleaf-st., $612.29; from Well to Sweetbriar, $2,450.08. Thomas Cronin Co., Careyalley, $488.30; Oneida-st., $1,216.70; Shiloh-st., $755.80; Sparta and Kerr-sts., $1,063.65. F. Deulius Bros., Booth and Craddock-sts., Sylvan and Second-aves., $3,946.88; Meade-st., $1,452.48. Frederick Ott, Marcella-st., $631.52; Second-ave., $8,669.35; Thirteenth-st., $1,922.74.

WATER-WORKS.

Massillon, O.—The Massillon Water Supply Company has made a proposition to the City Council offering to sell the water works plant for $315,000.

Quincy, Ill.—The Quincy Water Works Co. will be formed, in accordance with the plan of corporation counsel Pape, for the purpose of acquiring the water works for the city under the $650,000 option given by L. & C. H. Bull. The stock company will be formed by citizens who will hold the water works until the city has the sum necessary to take the plant off their hands.

CONTEMPLATED WORK.

South Norwalk, Conn.—This city has appropriated $60,000 for a filter.

Sisson, Cal.—The reconstruction of the water works system is contemplated.

Nevada, Mo.—This town voted recently in favor of municipal water works.

Augusta, Me.—Surveys are being made for a new water supply from Carleton Pond.

Clinton, Mass.—The water comrs. contemplate putting in about 200 water meters.

Montreal, Que.—The special water committee has recommended the purchase of three boilers.

New London, O.—Plans for a water works system will be made by Riggs & Sherman, of Toledo.

Mill Hall, Pa.—Council is considering propositions from private parties for installing water works.

West Allis, Wis.—Plans and estimates for a series of artesian wells are to be prepared and submitted to vote.

Donaldson, La.—Plans and specifications have been submitted for the extension of the water works system.

Lakeland, Fla.—The Hancock & Clay Engineering Company is making surveys for installing a water works plant.

Glasgow, Mont.—This town voted, Aug. 15, to issue $20,000 bonds for building a reservoir and lay mains.

American Fork, Utah—Plans are being considered for increasing the water supply of the towns of American Fork, Lake and Pleasant Grove.

Springfield, Mass.—An ordinance appropriating $300,000 for the establishment of a filtration plant at the Ludlow reservoir is being considered.

Tonawanda, N. Y.—The Depew Water Company, Depew, N. Y., is considering a plan for extending the service pipes along Military road to supply Elmerton.

Uxbridge, Mass.—The question of constructing a well on Croney Brook land and to lay a suitable pipe to the present town reservoir, has been favorably voted on.

Appleton, Wis.—The special water-works committee decided, Aug. 17, to recommend to council a resolution providing for the immediate construction of water works plant.

The question of issuing bonds for constructing water works systems has been favorably voted on at the following places: Minden, La.; Parker's Prairie, Minn.; Rockford, Wash.

Washington, D. C.—Maj. J. F. Case, cy. engr., of Manila, P. I., has placed before the secretary of war and Col. Edwards, chief of bureau of insular affairs, plans for the proposed water supply and sewerage system.

Spencer, N. C.—Bids will be considered for engineering and constructing water works and sewerage systems. Bids will also be received from parties desiring to build and own the plant, or for engineering the work for the municipality.

Kansas City, Mo.—Ordinances were passed, Aug. 22, providing for an appropriation of $13,900 for the purchase of a 25,000,000-gal. pump at Quindaro Station; $3,050 for purchase of certain land at Turkey Creek pumping station; $562.50 for changing course of Turkey creek.

The construction of water works systems is contemplated at the following places: Corinth, Miss.; Argenta, Ark.; Athens, Wis.; Jacksonville, Tex.; Abbeville, La.; Springdale, Ark.; Fowler, Mich.; Poynette, Wis.; Carlisle, Ky.; Columbus, Ga.; Cullom, Ill.; Redfield, Ia.; Woodward, Ia.

CONTRACTS TO BE LET.

Hawkeye, Ia.—Sealed bids are asked until 8 p. m. Sept. 5 for constructing a water works system. Guy E. Green, town clk.

Victoria, B. C.—Bids are asked until 3 p. m. Sept. 12 for furnishing 12,000-ft. of c. i. pipe. W. W. Northcott, purchasing agt.

Summerside, P. E. I.—Bids are asked until Nov. 1 for constructing a water-works and sewerage system. H. J. Massey, town clk.

Seattle, Wash.—Bids are asked until Sept. 2 for laying water mains in Fifth-ave. and Prospect and Colorado-sts. R. H. Thomson, cy. engr.

Great Falls, Mont.—Sealed bids are asked until 8 p. m. Sept. 5 for furnishing and erecting a steel storage standpipe. J. E. Moran, cy. clk.

Cleveland, O.—Sealed bids are asked until 8 p. m. Sept. 13 for the removal of 2 temporary cribs located in Lake Erie. W. J. Springborn, prest. B. S.

Cincinnati, O.—Sealed bids are asked until Sept. 9 for the construction of settling reservoirs and laying pump mains, etc., in

connection therewith near the village of California. August Herrmann, prest. bd. trustees.

Portage la Prairie, Man.—Sealed bids are asked until 8 p. m. Sept. 7 for laying 40,000-ft. of water mains and 36,000-ft. of sewers. Edward Brown, mayor.

Rankin, Pa.—Sealed bids are asked until Sept. 2 for sinking a wet well in the rear of the borough pump house. Rankin & Hengst, boro. engrs., 301 Smithfield-st., Pittsburg.

Portland, Ore.—Sealed bids are asked until Sept. 14 for furnishing and delivering 36,300 ft. 4, 6, 8, 10, 12-in. c. i. pipe and 80,000 lbs. of special castings. Frank T. Dodge, supt. water bd.

Columbus, O.—Sealed bids are asked until Sept. 13 for the permanent improvement of the banks and waste ways of the Grand Reservoir situated in Mercer and Auglaize Counties. Chas. E. Perkins, ch engr, pub. wks.

Roswell, N. Mex.—Bids will be received until Sept. 6 for constructing an earthen dam, retaining embankments, spillways, gates, pipe conduits and 3½ mis. of canal for the purpose of conducting the flow of water of the Hondo river to a reservoir 12 mis. southwest of this place. Thos. Ryan, acting secy., Washington, D. C.

Montrose, Colo.—Sealed bids are asked until Sept. 15 for constructing about 15 mis. of main distributing canals, involving about 700,000 cu. yds. of earthwork. Bids will also be received until Oct. 5 for constructing the Gunnison tunnel and approaches, involving about 30,000 ft. of tunnel and 120,000 ft. of excavation. Thos. Ryan, acting secy., Washington, D. C.

CONTRACTS AWARDED.

Asheville, N. C.—A contract for the French broad pipe line was awarded to Kelly & Felthaus for $3,197.

Essex Park, Ark.—The contract for constructing a water works system here was awarded to Pat Callahan of Hot Springs.

Philadelphia, Pa.—The contract for seventeen sand washers for the Torresdale filter plant was awarded Aug. 12 to E. M. Nichols for $13,095.

Prairie City, Ore.—A thirty-five-year franchise for a water works system has been granted and the contract for construction awarded to Joseph Reese.

Lancaster, Pa.—A contract for the erection of a city filtration plant was awarded Aug. 10 to the Pennsylvania Maignen Filtration Co., of Philadelphia.

Tell City, Ind.—The contract for extending the water mains from Outer Payne-st. to the city cemetery, 5,280 feet, was awarded to M. Boehmann at 4 cents a foot.

Summit, N. J.—A new contract has been made with the Essex-Union Water and Light Company, which provides that the city must maintain 150 hydrants at $20 each per year.

Kearny, N. J.—A contract was awarded, Aug. 17, to the New Jersey Suburban Water Co., to supply filtered water to this municipality at $82.50 per million gallons

Kansas City, Mo.—The contract for constructing two new 30-in. flow lines across the Chicago, Great Western Railroad bridge, was awarded, Aug. 15, to A. M. Blodgett.

Port Townsend, Wash.—The contract for constructing the Olympia gravity water system, which will supply this place, was awarded, Aug. 16, to the Jacobsen-Bade Co. of Portland, for $244,000.

Waterloo, Ind.—The town board has made a contract with the Ft. Wayne Trust Co. whereby the latter is to assume ownership and supply street lights and water hydrants at $60 and $70, respectively, per year, for 10 years.

New Albany, Ind.—The city council adopted an ordinance, Aug. 15, granting the New Albany Water Works Co. an extension of its franchise for a period of 25 years, and fixing the rates for fire hydrants, private consumers and manufacturers

East Orange, N. J.—Bids for furnishing a 5,000,000 gallon centrifugal pump were submitted, Aug. 15, as follows: Bellman & Sandford, $7,190; B. Franklin Hart, jr., & Co., $8,004; George A. Williams & Co., $7,885; Runyon & Carey, $8,915; Buffalo Forge Co., $8,055; D'Olier Engineering Co., $8,150; L. K. Comstock & Co., $9,776; Ralph J. Bristol, $11,213.

BRIDGES.

Waltham, Mass.—A new bridge over Charles river at Woerd-ave. is recommended by the Mayor.

Wabash, Ind.—Bids are asked until Sept. 5 for repairs to a number of bridges. W S. Davis, co. audt.

Rockville, Ind.—Bids are asked until Sept. 5 for a cement arch near Lodi Henry Grubb, co. audt.

Hamilton, O.—Sealed bids are asked until Sept. 10 for conshtructing certain bridges. C. Pabst, co. audt.

Natchez, Miss.—Sealed bids are asked until Sept. 5 for constructing five steel bridges. John F. Jenkins, chancery clk

Versailles, Ind.—Bids are asked until Sept. 6 for constructing a wagon bridge across Pipe creek. Nicholas Volz, co. audt.

Mt. Vernon, O.—Bids are asked until Sept. 3 for the superstructure of a bridge in Brown twp. O. A. C. Collins, co. audt.

Castledale, Utah.—Bids are asked until Sept. 5 for building a wagon bridge over Cottonwood creek. E. W. Fox, jr., co. clk.

Columbus, O.—Sealed bids are asked until Sept. 14 for constructing certain bridges. John Scott, clk. co. comrs.

Warrensburg, Mo.—Bids are asked until Sept. 6 for completing steel bridges and repair work. W. H. Burford, rd. and br. comr.

Manila, P. I.—Bids are asked until Dec. 1 for constructing a bridge over the Pasig River. John M. Tuther, secy. Municipal Board

Salem, Ind.—Sealed bids are asked until Sept. 5 for constructing stone abutments

in Washington and Brown twps. Frank E. Morris, co. audt.

Crown Point, Ind.—Bids are asked until Sept. 20 for constructing a stone arch and for a stone and iron bridge. Michael Grimmer, co. clk.

San Rafael, Cal.—Bids are asked until Sept. 6 for reconstructing two highway bridges crossing Salmon Creek. Robert E. Graham, co. clk.

Kirksville, Mo.—Bids are asked until Sept. 6 for building a bridge across Chariton river, near Sees Ford. Tyler Paine, co. surv.

Indianapolis, Ind.—Sealed bids are asked until Sept 3 for a bridge over White river at Michigan-st. John E. McGaughey, chmn. bd. co, cmrs.

Delphi, Ind.—Sealed bids are asked until Sept. 7 for constructing stone or concrete abutments and piers for 2 bridges. Fred H. Engel, co. audt.

Towson, Md.—Bids are asked until Sept. 8 for constructing 3 railway bridges and 3 reinforced concrete bridges. H. G. Shirley, engr. highways com.

Manistee, Mich.—The city engineer has been directed to procure plans and specifications for a new swing bridge across the river at Maple-st.

Redding, Cal.—Sealed bids are asked until Sept. 7 for constructing a stringer bridge across Stillwater at the Grant crossing. W. O. Blodgett, clk. bd. supvrs.

Cincinnati, O.—Sealed bids are asked until Sept. 6 for substructure work and drainage for Grandin road viaduct over Delta-ave.; also for superstructure for said viaduct. B. P. S.

Chicago, Ill.—Sealed bids are asked until Oct. 12 for superstructures of certain bridges across the extension of the main drainage channel. Zina R. Carter, prest. sanitary dist.

Celina, O.—Sealed bids are asked until Sept. 3 for substructure and steel superstructure over Wabash river on the State Line pike, one-half mi. east of Wabash. O. T. A. Weis, co. audt.

Indianapolis, Ind.—Bids were submitted Aug. 15 for erecting a bridge across Fall Creek at Northwestern-ave. The bids, which were for stone arch and concrete steel, were as follows: Williams Bros. & Morse, concrete steel $50,745, stone arch $78,300; E. M. Graves, concrete, $44,848; stone, $63,000; Moore-Mansfield Construction Company, concrete $45,760, stone $79,000; Fidelity Construction Company, concrete $54,490, stone $68,000; Collier Bridge Company, concrete $47,604.64; Shover & Pease, concrete $48,949; Union Asphalt Construction Company, concrete $50,000; J. B. Marsh, concrete $60,000. The contract was awarded to E. M. Graves, for a concrete and steel structure, for $44,848.

STREET LIGHTING.

Sutton, Neb.—Street lighting is contemplated.

Ephraim, Utah—An electric light plant is proposed.

Columbia, Miss.—An electric light plant will be established.

Fisher, Ill.—An electric light plant will be established.

Geneva, Neb.—The question of street lighting is being discussed.

Afton, Ia.—This town voted to install a new electric light plant.

St. Ignace, Mich.—This town voted to issue bonds for electric lighting.

Brighton, Ala.—The installation of an electric light plant is proposed.

Birmingham, Mich.—This village voted, Aug. 12, to light with acetylene gas.

Hazelgreen, Wis.—This town voted to issue $6,000 bonds for electric lighting.

Maitland, Mo.—The citizens have voted to issue bonds for establishing an electric plant.

Camilla, Ga.—This city contemplates the issue of $20,000 bonds for an electric light plant.

Columbus, Neb.—This town may vote on issuing bonds for a municipal electric light plant.

Middletown, O.—The board of public service adopted specifications, Aug. 16, for street lighting.

Centralia, Mo.—A ten-year franchise has been granted to P. H. Baldridge for an electric light plant.

Marion, Ind.—The Citizens' Light & Heating Co. has been granted a 25-year franchise by the city council.

Abbeville, La.—This city voted, Aug. 8, to issue bonds for constructing a water works and electric light plant.

Searcy, Ala.—Bids are asked until Sept. 15 for an electric light plant. Emmet Snipes, secy. electric light com.

Washington, Mo.—Plans have been made and an electric light and power plant will be installed by the Tibbe Electric Co.

Dayton, Ky.—The fire, water and light committee are considering the matter of changing from electric to Welsbach post burner.

Plaquemine, La.—A franchise has been granted the Ewing-Merkle Electric Company of St. Louis, Mo., for erecting an electric plant here.

Fremont, Neb.—Plans and specifications have been adopted and bids will be asked for enlarging the city electric lighting plant.

Suisun, Cal.—Bids are asked until Sept. 26 for a franchise for constructing and maintaining poles and wires for transmitting electric power.

Terre Haute, Ind.—Sealed bids are asked until Sept. 7 for lighting streets, public parks, etc., with electricity. S. C. Beach, secy. B. P. W.

Oshkosh, Wis.—The property of the Oshkosh Electric Light and Power Company was sold at public auction Aug. 11 to W. H. Whitney of Boston for $215,000.

Orange, Cal.—Bids are asked until Sept. 19 for a franchise granting the right to construct and maintain a gas plant, for laying gas pipes and conduits in streets, etc. H. Wyneken, clk. bd. trustees.

Allegheny, Pa.—The contract for a new dynamo for the city electric light plant was awarded to the Western Electric Company. All bids for rebuilding the

electric light plant exceeded the estimate of $31,000, and new bids will be asked.

Opelousas, Ia.—Contracts for new arc lights and the water and light meter system to be installed were awarded as follows: General Electric Company of New York, through its New Orleans agency, contract for 70 arc lights, at $2,292; Stanley Instrument Company, Great Barrington, Mass., 250 electric light meters, at $2,242; A. M. Lockett & Co., New Orleans, contract for 187 Worthington water meters, at $1,923.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Duluth, Minn.—The establishment of a municipal garbage plant is proposed.

Butler, Pa.—A new garbage furnace may be erected, the present one being inadequate.

Chico, Cal.—Bids are asked until Sept. 14 for furnishing this city with a road or street grader. C. E. Steinegul, cy. clk.

San Diego, Cal.—The city engineer is preparing estimates of the cost of installing a salt water street sprinkling plant.

Crafton, Pa.—Sealed bids are asked until Sept. 6 for constructing a garbage furnace, bids to include a 5 and 10-yr. plant. W. O. H. Elliott, boro clk.

Sacramento, Cal.—Bids for installing a garbage crematory were received as follows: Dundon's San Francisco Iron Works, for a 40-ton first grade Melvin destructor using garbage for fuel, if of a certain per cent. of moisture. Installation only and collection not included, $14,628 for the complete plant. A second-grade plant $900 lass. Decarie Co., Minneapolis—A Decarie, first-grade incinerator of 40 tons capacity at a cost of 50 cents, maximum, a ton, for $15,767 for the plant installed completely. For a plant of second grade, $14,132. James Touhey, Sacramento—A complete plant with all the necessary land over the north levee for 25 tons capacity, $11,500, and a 40-ton plant and land, $14,750; the crematory to be a Dixon destructor. Lilley & Thurston, San Francisco—A Dixon crematory, and to operate it ten years, the city to furnish site and fix rates for cremation and enforce them; at the end of 10 years the city to buy it at figure to be fixed by arbitrators; or, to furnish a Dixon plant complete of 25 tons capacity daily for $16,780, or, a higher plant of 40 tons capacity for $18,800.

PARKS.

Rochester, Minn.—Drs. William and Charles Mayo have presented this city with $5,000 for park purposes.

Bangor, Me.—Philip H. Combs, cy. engr., is preparing plans for the development of a new park on Thomas's Hill.

New York City—The Chelsea board of public improvements approved, Aug. 11, plans for a new park on the city block bounded by Ninth and Tenth-aves. and Twenty-seventh and Twenty-eighth-sts.

Alameda, Cal.—This city has obtained from the war department permission to utilize the strip of land along the tidal canal between Fruitvale-ave. and Park-st., government bridges for park purposes.

TOO LATE FOR CLASSIFICATION

Little Rock, Ark.—Brick paving has been decided upon for Elm-st. Mayor Lenon.

Hood River, Ore.—The immediate construction of a sewerage system is contemplated.

Joliet, Ill.—Ordinances have been adopted for paving Richards-st. and Third-ave.

Paxton, Ill.—The contract for paving W. State-st. was awarded to H. and G. Turner for $10,544.20.

Glenwood, Minn.—The village council has passed resolutions for constructing 7 blocks of sewers.

Ottawa, O.—Sealed bids are asked until Sept. 3 for constructing stone roads. O. C. Talbot, co. surv.

Cleveland Heights, O.—This village voted to issue bonds for constructing a water works system.

Westfield, N. Y.—This town voted to issue $5,000 bonds for improvements to the water works system. Water board.

Centerville, Ia.—The property owners on the public square have petitioned for brick paving instead of asphalt.

Fargo, N. D.—Sealed bids are asked until 5 p. m. Sept. 8 for constructing certain sewers. H. J. Gobson, cy. audt.

Delray, Mich.—The contract for paving River-st. was awarded Aug. 20 to Julius Porath of Detroit for $79,652.10.

Mattoon, Ill.—Sealed bids are asked until Sept. 6 for constructing concrete and brick sidewalks. Bert B. Cole, cy. clk

Kitanning, Pa.—The citizens voted to increase the borough indebtedness $10,000 for the purpose of paving and sewers.

DePere, Wis.—This city voted to purchase the present water system for $27,300 and expend $45,000 for pumping works.

Springfield, Mo.—Sealed bids are asked until Sept. 6 for constructing walks in certain streets. Geo. W. Culler, cy. engr.

Mt. Clemens, Mich.—Wm. J. Spain of Port Huron was awarded the contracts for paving Cass and Grand-aves. and Walnut-st.

Little Falls, N. Y.—John R. Baxter of Utica secured the contract Aug. 19 for constructing a concrete walk across Ward-square.

Hartford City, Ind.—The contract for paving seven alleys with brick was awarded Aug. 18 to Vaughn & Co. of Greenfield for $6,333.60.

Oneida, N. Y.—The contract for paving Vanderbilt-ave. with Metropolitan block was awarded Aug. 16 to Miller & Co. for $3,783.97.

Glasgow, Mont.—Special—This city has voted to issue $20,000 bonds for installing a water works system. A. Mayhow, cy. engr.

Toledo, O.—Council passed the ordinance Aug. 22 declaring its intention of issuing bonds in the sum of $500,000 for a pure water supply.

Lincoln, Ill.—The contract for more than 2 mls. of brick paving was awarded Aug. 22 to Bretz & Son of Springfield for about $50,000.

The construction of water works system is contemplated at the following places: Grimes, Ia.; North English, Ia.; Parker Point, Me.; Greeley, Colo.

Morris, Ill.—The contract for paving Liberty and Washington-sts. with brick was awarded to H. C. Finley of Hoopeston at $1.62 a sq. yd.

Riverside, Ind.—Sealed bids are asked until Sept. 8 for macadamizing Riverside-ave. J. Frank Mann, clk. bd. trustees, I. O. O. F. Block, Muncie.

Cleveland, O.—Sealed bids are asked until Sept. 21 for constructing steel bridges and stone and concrete masonry. Julius C. Dorn, clk. co. comrs.

Montgomery, Ala.—Sealed bids are asked until Sept. 5 for constructing hexagon block sidewalks in Goldthwaite and N. Perry-sts. R. S. Williams, cy. treas.

Paducah, Ky.—The contract for building a storm water sewer on Broadway-st., from Fifth to Ninth, was awarded Aug. 22 to Charles Robertson for $4,20[illegible]45

Havre, Mont.—Special.—Bids will be received until Sept. 15 for constructing a sanitary sewerage system; estimated cost, $22,000. C. W. Swearingen, cy. engr.

Freeport, Ill.—A special committee, composed of Aldermen Merrifield, Harden, McCarty and McGovern, has been empowered to purchase a new stone roller.

Great Falls, Mont.—Sealed bids are asked until Sept 5 for furnishing and erecting a steel storage standpipe. J. E. Moran, cy. clk.; D. L. Ellis, cy engr.

Philipsburg, Pa.—Sealed bids are asked until Sept. 6 for furnishing this borough with electric street lighting for one to five years. J. Albert Walton, chmn. light and heat com.

Akron, O.—Sealed bids are asked until Sept. 2 for paving Market-st. with brick and macadamizing Exchange-st., and for a new sewer in Conger-ave. Chas. H Watters, secy. B. P. S.

Marion, O.—Sealed bids are asked until Sept. 7 for paving Orchard and Prairie-sts. with brick block, and for building sewers in certain streets. Wm. Fies, clk. B. P. S.

Towson, Md.—Sealed bids are asked until Sept. 8 for constructing steel highway bridges and reinforced concrete bridges to replace old bridges. H. G. Shirley, rd. engr.

Marion, Ind.—Sealed bids are asked until Sept. 6 for macadamizing Twentieth and D-sts; also for brick sidewalk in Adams and Seventh-sts. C. G. Robbins, cy. clk.

Henderson, Ky.—Sealed bids are asked until Sept. 6 for constructing granitoid or artificial stone sidewalks curb and gutter on Second.st. from Main to Elm. J. H. Powell, mayor.

Richmond, Ind.—Sealed bids are asked til Sept. 19 for constructing cement sidewalks in W. Main, N. Ninth and S. Thirteenth-sts., and a sewer in an alley. John F. Taggart, cy. clk.

Freeport, Ill.—The contract for macadamizing portions of Lincoln-ave., Lincoln-boulevard, McKinley and Walton-aves. in West Freeport, was awarded to Wm. Ascher, for $18,863.40.

Dalton, Mass.—The selectmen have been authorized to borrow $7,300 to build a bridge on Housatonic-st. near the cotton mill, and a bridge and abutments on South-st. near the box shop.

Detroit, Mich.—The Barber Asphalt Paving Company submitted the lowest bid Aug. 22 for paving Canfield-ave., from John R. to the Brush farm. The company specified Sonoco asphalt for $2,698.29.

Cincinnati, O.—Sealed bids are asked until Sept. 20 for the construction and repair of artificial stone sidewalks in the eastern and western sidewalk districts. Geo. F. Holmes, clk. B. P. S.

Springfield, Ill.—Sealed bids are asked until 3 p. m. Sept 1 for building an 18-in. vitrified pipe sewer in State-st., from Edwards-st. to Lawrence-ave. H. H. Devereux, prest. bd. local impvts.

New Orleans, La.—Plans and specifications for the engines and other machinery to be installed in various pumping stations have been completed by George G. Earl, supt. of sewerage and water board.

Evansville, Ind.—Mayor Covert and the members of the water works committee are considering a proposition submitted by the Evansville Pure Water Company to install a filtration plant as an adjunct to the pumping station.

St. Paul, Minn.—The contract for paving Third-st., from Wabasha-st. to Seven Corners with asphalt was awarded to the Barber Asphalt Paving Company for $28,538, and from Sibley to Wabasha-st., with sandstone to Fielding & Shepley.

Peoria, Ill.—Sealed bids are asked until Sept. 13 for constructing a steel bridge and approaches across the Illinois river at Bridge-st. Robert Joos, cy clk.—The contract for lighting this city for the next two years was awarded, Aug. 23, to the Peoria Gas and Electric Light Co. at $65 per light per year.

Philadelphia, Pa.—The contract for paving and repaving forty-nine streets with asphalt was awarded, Aug. 20, to the Barber Asphalt Co. Other contracts awarded were as follows: Repairing 25 blocks with granite blocks, Barber Asphalt Paving Co., Thos. Cunningham, Cunningham & Murray, D. Mahon, Michael O'Rourke and W. A. Ran; macadamizing 13 county roads, building sewers and inlets for the Aramingo canal system, Michael O'Rourke, $255,000.—Contracts will be awarded Sept. 6 for 40 additional branch sewers and $700,000 worth of main sewers.

Cedar Rapids, Ia.—Sealed bids are asked until Sept. 2 for vitrified brick paving and cement curbing. W. L. Cherry, chm. bd. local impvts.